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AN ORGANIZATION FOR THE ENCOURAGEMENT OF PHARMACEUTICAL RESEARCH AND THE PROMOTION OF FRIENDLY INTERCOURSE AMONGST PHARMACISTS.

This Association of Chemists and Druggists and others interested in Pharmacy is managed by about twenty unpaid officers annually elected by the members.

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Gentlemen desiring to join the Conference can be nominated at any time on applying to a Secretary or any other Officer or member. The Name and Address of each candidate should be written legibly, and forwarded to "The Secretary," British Pharmaceutical Conference, 17, Bloomsbury Square, London, W.C., together with the subscription.

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The Annual Subscription is Seven Shillings and Sixpence. For this sum each member is entitled to one copy of the Year-Book, carriage free; and to attend the Annual Meetings.

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The Conference Year commences on July 1st, and Annual Subscriptions are due in advance on that date. The Year-Book is posted as soon as published (in December) to every member who has previously paid his subscription. To members joining later, the volume is posted immediately on receipt of a Money Order or other form of remittance. The price of extra copies of the volume for 1872, and subsequent issues is 7s. 6d. Price of the Year-Book to non-members, 10s.

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WITH THE

TRANSACTIONS

OF THE

BRITISH PHARMACEUTICAL
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AT THE

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AN ORGANIZATION ESTABLISHED IN 1863 FOR THE ENCOURAGEMENT OF PHARMACEUTICAL RESEARCH, AND THE PROMOTION OF FRIENDLY INTERCOURSE AND UNION AMONGST PHARMACISTS.

THE most important ways in which a member can aid the objects of the Conference are by suggesting subjects for investigation, working upon subjects suggested by himself or by others, contributing information tending to throw light on questions relating to adulterations and impurities, or collecting and forwarding specimens whose examination would afford similar information. Personal attendance at the yearly gatherings, or the mere payment of the annual subscription, will also greatly strengthen the hands of the executive.

A list of subjects suggested for research is sent to members early in the year. Resulting papers are read at the annual meeting of the members; but new facts that are discovered during an investigation may be at once published by an author at a meeting of a scientific society, or in a scientific journal, or in any other way he may desire; in that case, he is expected to send a short report on the subject to the Conference.

The annual meetings are usually held in the provinces, at the time and place of the visit of the British Association; that for 1882 will be held at Southampton, on Tuesday and Wednesday, August 22nd and 23rd.

Gentlemen desiring to join the Conference can be nominated at any time on applying to the Secretary, or any other officer or member. The yearly subscription is seven shillings and sixpence, payable in advance, on July 1st. Further information may be obtained from

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THE YEAR-BOOK OF PHARMACY.

The Conference annually presents to members a volume of 500 to 600 pages, containing the proceedings at the yearly meeting, and an Annual Report on the Progress of Pharmacy, or Year-Book, which includes notices of all pharmaceutical papers, new processes, preparations, and formulæ published throughout the world. The necessary fund for accomplishing this object consists solely of the subscriptions of members. The Executive Committee, therefore, call on every pharmacist—principal, assistant, or pupil—to offer his name for election, and on every member to make an effort to obtain more members. The price of the Year-Book to non-members is ten shillings. The constitution and rules of the Conference, and a convenient form of nomination, will be found at page 319.

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INTRODUCTION.

THE masterly researches on the mydriatic alkaloids by Professor Ladenburg, to which we assigned the first place in the introductory pages of the preceding volume, fitly occupy the same position in the present work, owing to the great and unabated interest manifested by the scientific world in their further development. In his earlier reports two such bases only were spoken of as definitely proved to exist in nature, viz., atropine, $C_{17}H_{23}NO_3$, occurring in *Atropa Belladonna* and *Datura Stramonium*, and, hyoscyamine, corresponding to the same formula and occurring in the same plants as well as in *Hyoscyamus niger* and *Duboisia myoporoides*; while daturine and duboisine were shown to be identical with hyoscyamine. A third member is now added to this group by the isolation from *Hyoscyamus niger* of a second alkaloid, the presence of which in the mother liquor left after the crystallization of hyoscyamine had been already recognised by him in his previous investigations. "*Hyoscine*," the new base, agrees with atropine and hyoscyamine in its formula, but differs from both in yielding, upon treatment with barium hydrate, tropic acid and pseudotropine, whereas the two other alkaloids named split up under the same conditions into tropic acid and tropine. The name "*hyoscine*" had previously been applied by him to a body obtained from hyoscyamine by the action of barium hydrate; but the proved identity of this body with tropine justifies the transfer of this name to the second alkaloid naturally occurring in henbane. The series of "*tropeines*," or artificial bases produced by the action of dilute hydrochloric acid on various organic salts of tropine, has also been further extended, and has gained additional interest through the observation that homatropine (oxytoluyltropeine), a member of this series, possesses mydriatic properties fully equal to those of atropine. The most important feature, however, in Professor Ladenburg's recent results is the decided progress made towards

the artificial production of atropine, an advance so great as to place the actual synthesis of this alkaloid within measurable distance. His previous success in reproducing atropine from its decomposition products, tropic acid and tropine, naturally pointed to the artificial formation of one of these two bodies as the first step to be attempted; while the close relation, observed by him in conjunction with L. Rügheimer, between hydratropic, atrolactic, atropic, and tropic acids, and the convertibility of these acids into each other, indicated a suitable starting-point in this inquiry. By treating acetophenone with phosphorus pentachloride, heating the resulting dichlorethylbenzol with alcoholic solution of potassium cyanide, then removing the alcohol by distillation, boiling the residue with barium hydrate, and finally acidifying the product with hydrochloric acid, these chemists have succeeded in producing atrolactic acid, the conversion of which into atropic acid, and subsequently into tropic acid, presents no difficulty. The synthesis of tropic acid being thus accomplished, it now but remains to attain the same measure of success with regard to tropine, in order to ensure the synthesis of atropine.

In another direction, too, the chemistry of vegetable alkaloids can boast of a similar triumph. Morphine has been converted into codeine; and this important result has been brought about in a manner creditable alike to its author and to modern organic research in general. A correct appreciation of the fact that morphine, though a decided base, also possesses the characters of a phenol, has led M. Grimaux to infer, that if this alkaloid be regarded in the latter capacity, codeine, differing from it in composition by CH_2 , may be considered as the methylic ether of this phenol, and, as such, should be producible from it. The soundness of this reasoning stands fully confirmed by the successful issue of his experiments. One molecular weight of morphine, when gently heated in alcoholic soda solution with a molecular weight of methyl, yields a small proportion of free codeine, which may be separated by means of ether from the iodomethylate of morphine-soda, the main product of the reaction. After suitable purification, the alkaloid thus obtained agrees in all its characters with codeine extracted from opium. Ethyl iodide, under the same conditions, yields a new base, homologous with codeine; and it is considered more than probable that, by extending the same treatment to the iodides of other alcohol radicals, a whole series of such artificial bases may be obtained from morphine. Almost at the same time these experiments were being performed, and entirely independent

of M. Grimaux, the complex functions of morphine above alluded to also occupied the attention of another chemist, M. Chastaing, whose labours in this direction have resulted in the preparation and analysis of several definite chemical combinations of this alkaloid with potash, lime, and baryta.

Whatever doubt may hitherto have existed as to the presence of codeine and of narceine in the poppy heads of commerce, is now definitely removed by a communication on this subject addressed by Mr. T. B. Groves to the recent meeting of the British Pharmaceutical Conference. That some uncertainty did still prevail on this point may be seen from the statements respecting the chemistry of this drug in the "Pharmacographia," in which narceine is left entirely unmentioned among the known constituents of these capsules, while the presence of codeine is spoken of as somewhat doubtful. The variation in composition due to climate, soil, and different stages of maturity, the multitude of alkaloids probably present, the very minute proportion in which they occur, and the troublesome abundance of extractive and resinoid substances, referred to by Mr. Groves as a source of considerable difficulty and loss in the isolation and purification of these alkaloids, all combine to render anything like a complete elucidation of the chemistry of the poppy so intricate a task, that the discrepancies presented by the literature of this subject are far from surprising.

The observation, repeatedly made, that strychnine of commerce has not always the same composition, is confirmed by Messrs. A. Claus and R. Glassner, who find the formula of this base to be in some instances $C_{23}H_{33}N_2O_3$, while in others it is decidedly $C_{21}H_{33}N_2O_2$. They do not regard this difference as at all due to the presence of impurities, but believe that *Strychnos nux vomica* is capable of producing this alkaloid with a variable amount of carbon. Mr. W. A. Shenstone, in continuation of his researches on brucine, reports having extracted the alkaloids from a large quantity of *nux vomica*, with the precaution of avoiding all heat in the presence of free acids or alkalies and employing as little heat as possible in the whole process. He describes a process of purification by which he has succeeded in freeing the brucine from every trace of strychnine. The numbers obtained in his analysis of pure brucine agree with $C_{23}H_{26}N_2O_4$, the formula generally adopted for this alkaloid. It still remains to be shown whether brucine perfectly free from strychnine does or does not possess toxic properties. The so-called *igasurine*, supposed to exist in the mother liquor left on the extraction of strychnine and brucine, and regarded by Schützenberger as

a complex mixture of bases, is found by Mr. Shenstone to be nothing but impure brucine.

Dr. C. R. A. Wright publishes a valuable summary of the final results of his long series of investigations of the aconite bases, including full directions for determining the purity of aconitine, the crystallizable alkaloid and chief active principle of *Aconitum Napellus*. In his opinion, the development of this subject has now reached a stage at which it may fitly pass from the hands of the purely scientific chemist to those of the pharmacist and manufacturing chemist, since the questions still remaining to be solved are the determination of the circumstances (as to soil, climate, age of plant, etc.) which influence the relative proportion between the crystallizable aconitine and the non-crystalline alkaloids naturally accompanying it, and the elaboration of the best method of separating the crystallizable base from these amorphous bodies on the large scale. It is to be hoped that efforts in this direction will prove successful, for upon this success depends the question whether pure aconitine is likely to find favour as a medicinal agent in preference to the indefinite mixture of bases now sold under that name.

Messrs. E. Harnack and H. Meyer claim to have established the presence of a second alkaloid in jaborandi and in commercial pilocarpine. This new base, which they propose to call "*jaborine*," is said to differ from pilocarpine in its behaviour towards solvents and in its physiological action. Their formula for pilocarpine, $C_{11}H_{16}N_2O_3$, does not agree with that found by Mr. Kingzett (*Year-Book of Pharmacy*, 1877, p. 615). The latter, however, maintains his own formula, the correctness of which is moreover confirmed by M. Poehl. Mr. Kingzett also declines to admit that Messrs. Harnack and Meyer have adduced sufficient evidence of the existence in true jaborandi of an alkaloid distinct from pilocarpine; and in this opinion he is supported by Mr. A. W. Gerrard, who attributes the results of these chemists to the presence of false jaborandi (*Piper reticulatum*) in the material operated upon.

The results of careful analyses of conine and of some of its salts have convinced Prof. A. W. Hofmann that the formula $C_8H_{15}N$, generally accepted for this base, ought to be replaced by $C_8H_{17}N$. Piturine, the alkaloid discovered in pituri by Mr. Gerrard in 1878, and subsequently alleged by M. Petit to be identical with nicotine, has now regained its individuality; for a close study of its characters and reactions recently carried out by Prof. Liversidge, shows it to be distinct from that base, as well as from conine, picoline,

pyridine, and aniline. Analyses of the alkaloid and of its mercuric chloride double salt lead to the formula $C_{19}H_{16}N_2$. The latest researches on nicotine by Mr. R. Laiblin and MM. Cahours and Etard, are confined to some bromo-derivatives and oxidation products of this base.

Messrs. Hoogewerff and van Dorp have continued their researches on the action of potassium permanganate on the cinchona alkaloids, and report that quinine, cinchonine, quinidine, and cinchonidine, when thus oxidized, yield tricarboxypyridinic acid, together with ammonia, oxalic, and carbonic acids. An investigation by Dr. O. Hesse, of the action of acetic anhydride and of hydrochloric acid on some of the cinchona bases, leads this chemist to the conclusion that quinine and cinchonidine contain one hydroxyl-group capable of being replaced by acetyl. The same author also supplies further evidence of the existence of homocinchonidine as an alkaloid distinct from cinchonidine, and thereby disproves the supposition, recently expressed by Mr. Z. H. Skraup (*Year-Book of Pharmacy*, 1880, p. 33), that these two bodies are identical. The important subject of quinine testing has received some further contributions from Dr. G. Kerner and Dr. Hesse, whose previous work in this direction will be familiar to every reader of pharmaceutical literature. The former criticises somewhat unfavourably the process recommended by Dr. Hesse a few years ago (*Year-Book of Pharmacy*, 1879, p. 24), and quotes instances tending to show its occasional liability to error. He pleads in favour of his own mode of testing, known as the "ammonia-method," and adopted in the German Pharmacopoeia, and gives a more detailed description of this test. Since the amount of ammonia required for precipitating and redissolving the alkaloid from a definite volume of saturated solution of pure quinine sulphate is always constant under equal conditions, he regards the volume of ammonia solution needed for attaining the same result with the sample of sulphate under examination as a reliable measure of its purity and a ready means of approximately estimating the proportion of other alkaloids present in impure samples. Dr. Hesse, however, in returning to the charge, points out that when cinchonidine sulphate, instead of being merely mixed with sulphate of quinine, is crystallized together with the latter, it assumes a form in which it escapes detection by this test to a not inconsiderable extent. Both chemists agree that the amount of water of crystallization found in dry and non-effloresced samples of commercial sulphate often affords a ready indication of their purity. A report on the thalleioquin test, by Mr. C. F.

Zeller, deals with the conditions affecting the reaction, and shows the superiority of bromine water over chlorine water for the purpose of this test.

Paytine, the base discovered by Dr. Hesse in a white bark of unascertained botanical origin, known as *cortex chinae albae de Payta*, has lately been examined by Dr. N. Wulfsberg, with results inducing him to regard this body as most probably identical with aspidospermine, the alkaloid of white quebracho bark (*Aspidosperma Quebracho*). In opposition to this view, both Dr. Hesse and M. Arato point out differences in the composition and characters of these two bases, clearly proving them to be distinct bodies. The investigation leading Dr. Hesse to this conclusion has also revealed the existence in quebracho bark of a second alkaloid, which he proposes to name *quebrachine*, as well as the probable presence of several other bases. Quebrachine, $C_{21}H_{29}N_3O_3$, possesses toxic properties.

The often debated question whether or not caffeine is capable of forming a definite chemical combination with citric acid, is ably discussed by Mr. J. U. Lloyd, whose results have no longer any reasonable doubt as to the existence of a definite citrate of this base. The difficulty hitherto experienced in producing such a compound is shown to be due to the fact that the salt is decomposed by all solvents which, like water or alcohol, dissolve citric acid readily and caffeine sparingly, and that for this reason the use of such solvents in the preparation of this salt can only lead to the formation of a mere mixture of acid and base. That such a product is nothing but a mixture, is proved by the action of cold chloroform, which dissolves from it the caffeine, leaving the citric acid undissolved. Mr. Lloyd therefore employs a mixture of 2 parts of chloroform and 1 part of alcohol, which exerts a nearly equal solvent action on both acid and base; and by means of this menstruum he obtains a real compound, the constituents of which cannot be separated by treatment with chloroform. The relation of caffeine to theobromine is receiving the attention of able investigators; but all attempts of converting one into the other have so far proved unsuccessful.

The differences in the formulæ given by different chemists for picrotoxin, the poisonous principle of *cocculus indicus*, have induced Messrs. Barth and Kretschy to reinvestigate this substance. They report that, by a process of fractional crystallization from benzol and water, they have ascertained this body to be a mixture of three different principles, which they propose to name "picrotoxin,"

"picrotoxin," and "anamirtin." The correctness of this statement, however, is called in question by MM. Paternò and Oglialoro, who arrive at the conclusion that "picrotoxin" and "picrotoxin" of those chemists are decomposition products of true picrotoxin, formed during the repeated boiling with benzol. This view is confirmed by the results of a research recently published by Drs. E. Schmidt and E. Löwenhardt. The latter also announce the isolation from *cocculus indicus* of a new body, provisionally named by them "*cocculin*," which may possibly prove to be identical with the anamirtin of Messrs. Barth and Kretschy.

In an interesting article on "ptomaines," the alkaloidal bodies found in exhumed corpses as the result of putrefactive processes, Prof. Husemann deals with the relation of these substances to forensic chemistry and toxicology, and lays particular stress upon the importance of discovering reactions which will distinguish these poisonous bodies from the natural vegetable alkaloids and similar toxic principles. MM. Brouardel and Boutmy claim to have established such a distinction, by showing that the ptomaines exercise a reducing action upon potassium ferricyanide, which, with the exception of morphine and veratrine, is not shared by vegetable alkaloids; but the fallacy of this statement is demonstrated both by M. Gautier and M. Tanret, who give quite a list of poisonous vegetable principles, all of which, more or less, effect a similar reduction.

A further report on meconic acid, by Mr. D. B. Dott, furnishes additional evidence against the assumed tribasic nature of this acid, and shows that the so-called meconates of silver and lead do not possess the character of definite salts. A handy method of purifying chrysophanic acid, consisting in the precipitation of the acid from its chloroform solution by means of rectified spirit, is described by M. Agema. Prof. Thorpe directs attention to the ready convertibility of gallic acid into pyrogallol by heating a glycerin solution of the former for a short time to 190–200° C., and suggests this mode of conversion as an advantageous process of preparing pyrogallol acid for photographic purposes. In connection with this subject he reminds pharmacists of the necessity of avoiding too high a temperature in the preparation of the official *glycerinum acidi gallici* in order to prevent the formation of pyrogallol. The spontaneous reddening of carbolic acid is attributed by Mr. H. W. Langbeck to the formation of rosolic acid under the influence of light.

The synthesis of citric acid has been successfully carried out by

MM. Grimaux and Adam, and by Prof. Kekulé, independently and by different methods, the two former selecting dichloroacetone, and the latter malic acid, as a starting-point, both of which substances can be built up from their elements. As a still more interesting and important success in organic synthesis, we refer to the artificial production of indigo accomplished by Prof. Baeyer. The leading features of this process consist in the action of bromine on ortho-nitro-cinnamic acid, the treatment of the resulting bromo-derivative with alcoholic potash solution, and the subsequent treatment of the orthonitrophenylpropionic acid thus formed with reducing agents in the presence of an alkali. It is needless here to discuss the importance of a result which will ever rank high among the achievements of organic chemistry.

Among the essential oils investigated during the year, we here refer to that of ginger as the one most likely to prove of interest to the readers of this volume. In a report on this oil presented to the British Pharmaceutical Conference, Mr. J. C. Thresh states that it is a very complex mixture of hydrocarbons and of their oxidation products, the former probably comprising a sesquiterpene, $C_{15}H_{24}$, a terpene, $C_{10}H_{16}$, and cymene, $C_{10}H_{14}$. The hydrocarbon of the formula $C_{15}H_{24}$ contained in the English oil, is said to be isomeric with the corresponding one of the foreign oil; but it differs from it in its boiling point and its action on polarized light. The odorous principle (most probably an oxygenated compound) is contained in the more volatile portion of the oil, and is most susceptible of oxidation. Mr. Thresh adds that a dilute alcoholic solution of the oil is a remarkably good flavouring agent, capable of imparting the pleasant aroma of Jamaica ginger to a large proportion of water.

The methods of preparing hydrobromic acid for medicinal use have lately received some attention at the hands of scientific pharmacists. Mr. E. Goebel speaks favourably of Prof. Schaeffer's process, consisting in the decomposition of barium bromide with dilute sulphuric acid, and shows that the barium salt may be readily prepared by heating a moist mixture of ammonium bromide and barium carbonate. The liberation of the acid from potassium bromide by means of tartaric acid is objected to by him on the ground that, owing to the solubility of potassium bitartrate in hydrobromic acid, the product necessarily retains a considerable amount of this salt in solution; and this objection is shared by Messrs. Thresh and R. Wright, who demonstrate, moreover, that the acid thus prepared cannot be relied upon to contain more than

7 or 8 per cent. of actual hydrobromic acid. A process described by Mr. F. W. Fletcher is based on the well known reaction between free bromine and sulphuretted hydrogen, and is stated to give a very satisfactory result. We can quite confirm this statement, but are at the same time of opinion that no valid objection can be raised either against Dr. Squibb's method (the decomposition of hot saturated solution of potassium bromide by sulphuric acid, and subsequent distillation of the decanted liquid), or the phosphorus process (the gradual action of bromine upon phosphorus in the presence of water). The latter, carefully conducted, is unattended with any danger or difficulty, and possesses the advantage of yielding phosphoric acid as a by-product. There is, indeed, no lack of suitable processes for the preparation of this acid; and what appears to be wanted is, not so much the invention of new methods, as the official introduction of a definite standard of strength for its medicinal administration. The various processes for the preparation of ammonium bromide have engaged the attention of Dr. E. Biltz, who, in the "Official Proposals for Alterations of the German Pharmacopœia," gives preference over all others to the method consisting in the gradual addition of ammonia solution to bromine until the mixture contains but a slight excess of the latter, the subsequent reduction of the bromate and hypobromite, and simultaneous conversion of the free bromine into hydrobromic acid by means of sulphuretted hydrogen, and the evaporation of the boiled and filtered liquid mixed with an excess of ammonia. For the preparation of pure hydrochloric acid, M. de Koninck suggests the use of ammonium chloride in the place of sodium chloride, on account of the more steady and regular action of the hot sulphuric acid upon the former, and the non-crystalline nature of the residue. Pure phosphoric acid is recommended by M. Ditte to be prepared by saturating a solution of sodium phosphate with hydrochloric acid gas, decanting the clear liquid from the precipitated sodium chloride, and removing the excess of hydrochloric acid by evaporation. Mr. J. U. Lloyd criticises the official process of preparing this acid, pointing out that the complete expulsion of the excess of nitric acid, by heating the concentrated acid in a platinum dish, is difficult to attain without a partial decomposition of the residue. To obviate this risk, he suggests the elimination of the nitric acid in the form of nitrous ether, by the addition of alcohol to the concentrated liquid and further evaporation until the alcohol is again expelled. Another report on the same acid, by Mr. H. P. Cooper, deals with the conditions under which orthophosphoric

acid may best be obtained in a crystalline form. Two new oxides of bismuth, answering respectively to the formulæ Bi_3O_7 and Bi_4O_7 , are described by Prof. M. M. P. Muir. Mr. P. Solthier recommends a new process for the preparation of perfectly pure silver nitrate from commercial silver, the main features of which are the following:—The solution of the impure silver in dilute nitric acid is mixed with the requisite amount of hydrochloric acid to ensure complete precipitation, the precipitated chloride, after being washed by decantation, dissolved in ammonia, and the filtered ammoniacal solution reduced in a stoppered cylinder by means of a long strip of copper foil. The pure metallic silver thus slowly precipitated is collected on a filter, well washed with distilled water, and then dissolved in pure nitric acid.

Of the analytical methods published during the year, a good many, owing to their more or less direct interest to pharmacists, have found a place in this volume; but of these a selection only can be alluded to in the present place. Mr. O. Schlickum proposes an ingenious process for the detection and approximate estimation of chlorine in iodide and bromide of potassium, consisting in the precipitation with an excess of silver nitrate, treatment of the washed precipitate with a small quantity of solution of ammonia to extract the silver chloride, and the addition to the ammoniacal filtrate of a standard solution of potassium iodide (or of potassium bromide, if the test is applied to the bromide), until the silver is completely precipitated. According to Dr. C. Roth, chlorine may be colorimetrically estimated in potassium bromide by distilling with potassium bichromate and sulphuric acid into a receiver containing very dilute solution of ammonia, and comparing the distillate with solutions of ammonium chromate of known strength. We have recently tested both processes; and while we can confidently recommend the former, we cannot report favourably on the latter, finding that the depth of colour of a chromate solution does not afford a satisfactory criterion of its strength. The coloration produced in tannin solutions by caustic alkalies and normal alkaline carbonates is described by Mr. W. Bachmeyer as a reaction of such extreme delicacy as to render such a solution available as a test for these substances, much superior to litmus. A new mode of assaying ferrum redactum, described by Mr. O. Wilner, is based upon the observation that strong solution of mercuric chloride, when heated with the sample, is without action on the oxides of iron, while it reacts with the metallic iron in such a manner as to convert the latter into ferrous chloride and to cause a precipitation of mercurous

chloride and metallic mercury. The ferrous chloride formed from the metallic iron may be titrated in the solution with potassium permanganate, and the ferrous oxide can then be extracted from the undissolved portion with hydrochloric acid and titrated in the same manner. M. Baudrimont recommends a method for the analysis of bismuth subnitrate, consisting in the decomposition of a weighed quantity of the salt with a known volume of standard soda solution, and the determination of the excess of alkali in a measured portion of the filtrate. The proportion of nitric acid in the sample having been thus ascertained, the bismuth is then estimated by igniting a fresh portion of the subnitrate in a crucible and weighing the residual oxide. The reducing action of arsenious acid upon ammoniacal silver solution serves as the basis of a process suggested by Mr. L. Mayer for the estimation of arsenious acid in the presence of arsenic acid. The detection and estimation of arsenic in forensic analyses forms the subject of investigations by Mr. E. Fischer, Prof. Selmi, and Dr. E. Reichardt, the latter of whom strongly advocates the modification of Marsh's test first described by Lassaignac, consisting in the action of the arseniuretted hydrogen upon a solution of silver nitrate. The chief novel feature introduced by him into this process is the application of very strongly acidified silver solution, which he finds to decompose the arseniuretted hydrogen much more readily and completely than a neutral solution. After the termination of the reaction he adds an excess of bromine water to the mixture, in order to redissolve any trace of arsenic that may have been precipitated along with the metallic silver, and to throw down the silver from the solution as bromide, and finally estimates the arsenic acid in the filtrate by precipitation as ammonio-magnesium arsenate. Prof. Selmi proposes certain modifications in the processes of Scherer and Mitscherlich for the detection of free phosphorus in poisoning cases. The same subject is also dealt with by Dr. Hager, who shows that the phosphorus may be conveniently extracted from the substances under examination by shaking with petroleum ether and then, after decanting the latter, detected in it by Scherer's test. In a note on the detection of nitrites in potable waters, Mr. Ekin demonstrates that the reaction with potassium iodide and starch, if conducted with due care, is certainly not inferior in delicacy to the more modern metaphenylene-diamine and naphthylamine tests. Dr. E. Pfüger reports upon the conditions under which Liebig's method for the determination of urea in urine may best be relied on to yield accurate results; while M. Renson gives a descrip-

tion of a new form of apparatus for the estimation of the same substance by means of sodium hypobromite. The frequent adulteration of essential oil of mustard with carbon bisulphide is referred to by Prof. Flückiger, together with the means of detecting this fraud. Prof. Hofmann, alluding to the same subject, points out that minute quantities of this substance occur in all samples of mustard oils, both natural and artificial, and may be accurately determined therein by means of triethylphosphine, with which carbon bisulphide yields pinkish red crystals of the compound $\text{Et}_3\text{P CS}_2$.

In a paper read before the British Pharmaceutical Conference at York, Mr. Holmes discusses the important question which kinds of cinchona bark should be used in pharmacy, and suggests that the barks cultivated in India, Java, etc., should replace the now officinal barks of South American origin, on account of the general inferiority of the latter as now met with in commerce. As regards the species best suited for general medicinal use, he agrees with Prof. Flückiger in giving preference to the bark of *Cinchona succirubra*. His proposition, to supersede the South American by Indian-grown barks, is opposed by Mr. W. de Neufville, on account of the great success at present attending the planting and cultivation of cinchonas in Bolivia and Peru. The latter also advocates the claims of the American quill calisaya, as a rich quinine-yielding bark, to take the place of the now more and more discredited flat calisaya of American origin. Mr. J. E. Howard, in a communication to the same meeting, illustrates in a forcible manner the degeneration of *Cinchona succirubra* by age, and the consequent mistake of the excessive cultivation now practised in India, as well as the great advantage to be derived from the process of renewing. The same paper is pregnant with other points of interest, with which it is useless to attempt to deal justly in the few lines here at our disposal.

Mr. Gerrard's researches on the relative merits of wild and cultivated belladonna point to the conclusion that the wild plant is the more active in all its parts, and that in both kinds the largest proportion of alkaloid is to be found in the leaves. The same chemist publishes an improved process for the preparation of atropine, the main features of which consist in the avoidance of acid in the extraction, and the use of ammonia, in the place of fixed alkalies or their carbonates, for the liberation of the alkaloid.

Various kinds of Japanese aconite root are described by Dr. Langgaard, M. Wasowicz, and M. Geerts, and shown to be the tubers, in different stages of preparation, of wild and cultivated

plants of *Aconitum Fischeri* and possibly one or two other species. One of these has yielded Dr. Langgaard a most poisonous crystallizable alkaloid, far exceeding in toxic power both aconitine and pseudaconitine. The same author announces the isolation from Japanese belladonna (*Scopolia Japonica*) of two distinct alkaloids, *rotoine* and *scopoleine*, both of which he describes as similar to atropine in their physiological action. Mr. T. Greenish gives the results of his examination of some samples of Jamaica-grown jalap, showing this drug to contain considerably less resin than the average of good Mexican jalap, and to approach more nearly that grown by Mr. Smith in the Botanical Gardens of Trinity College, Dublin. An examination of a number of commercial specimens of leptandrin, the resin of leptandra root, by Mr. J. U. Lloyd, leads to the inference that the variation in their appearance and properties arises from a different degree of fineness of the powder, and also from actual differences in their composition. Improved formulæ for the preparation of this resin and of a dry alcoholic extract of the root are given by the same writer. The purification of storax by means of alcohol, as recommended in the British Pharmacopœia, is described by Dr. J. Biel as a wasteful process, involving the loss of upwards of 30 per cent. of the balsam; while the application of benzol in place of the alcohol is stated to furnish 90 per cent. of a superior product. Mr. A. Janssen supplies a description of the characters of an authentic specimen of Chian turpentine, which is likely to prove valuable to our readers on account of the extensive falsification to which the small yield of this drug and the sudden and quite unforeseen demand for it have given rise. Prof. Flückiger shows the collection of this oleo-resin need not remain confined to the island of Ohio, since *Pistacia terebinthus* grows plentifully in Algeria, and an identical product may also be obtained in abundance from *Pistacia atlantica*, a tree distributed over the whole of Northern Africa. Meanwhile, the question of the medicinal merits of this drug remains an open one. The value of Mikania Guaco as a remedy for snake bite is confirmed in a communication from New Granada, sent by Mr. R. B. White to the Directors of the Royal Gardens at Kew, in which the writer describes its mode of application, and gives his personal testimony as to its efficacy. The plant is widely diffused in tropical America, and, as shown by Mr. J. G. Baker, is known under a great many different botanical names. The bark of *Strychnos Gantheriana*, known in Tongkin under the name of *hoang-nan*, is spoken of as another valuable remedy for snake bite

as well as for hydrophobia and certain forms of skin diseases. The curative action, in poisonous bites, of this and other members of the *Strychnos* family, is attributed by Prof. C. Pavesi to the antiseptic and antifermentative power of the alkaloids strychnine and brucine.

The complete harmlessness of fool's parsley (*Aethusa Cynapium*) is again asserted by Dr. J. Harley, and proved on this occasion by evidence calculated to convince the most incredulous. He justly complains of the perpetuation of a popular fallacy by the authors of modern works, who, in the face of satisfactory testimony to the contrary, continue to speak of this plant as a poison.

Some of the recent contributions to the literature of spurious drugs and of drug adulteration call for a brief notice in this chapter. Dr. A. Tschirch draws attention to a spurious jaborandi, the botanical source of which is at present unknown, but is probably a member of the Rutaceæ. It differs from the genuine drug in its brighter colour, its less prominent veins, and the appearance of its transverse section. The rhizome of *Sium longifolium*, a variety of *S. latifolium*, is described by Dr. C. Bernbeck as a frequent adulterant of valerian, from which it may be distinguished by its comparative lightness, and the less pithy and more wrinkled appearance of its fibres. Mr. T. E. Greenish mentions the occurrence in the London market of rose petals artificially coloured with rosaniline, and recommends a process for the detection of this fraud. A spurious and poisonous star anise is reported upon by Prof. Husemann, Mr. E. M. Holmes, Dr. A. Langfurth, and Mr. J. F. Eykman, all of whom describe the characters by which it may be distinguished from the true article. The fruit in question is that of *Illicium religiosum*, Sieb., a Japanese tree which several well known writers have erroneously supposed to be a mere variety of *Illicium anisatum*. Considering the decidedly toxic properties of the Japanese fruit, it is fortunate that the differences in odour, taste, and the appearance of both carpels and seeds, between this and the true star anise, are sufficiently striking to render the distinction of the two fruits a comparatively easy task. Dr. T. Peckolt gives a list of physical and chemical characters by which the balsam of *Myroxylon peruiferum* may be distinguished from true balsam of Peru, with which it agrees in many of its medicinal properties. The testing of Peruvian balsam forms the subject of a report by Prof. Flückiger, in which stress is laid on the specific gravity of the sample, and its behaviour to lime and to bisulphide of carbon.

Chemical research has again been extended to a considerable

number of vegetable drugs. Pereiro bark, the produce of a species of *Geissospermum*, an extract of which is used in Brazil as a febrifuge, has been investigated by Dr. O. Hesse, who reports the isolation from it of two alkaloids, *geissospermine* and *pereirine*. In the further course of his researches on dita bark (*Alstonia scholaris*), the same author has succeeded in showing that, besides the alkaloid ditamine, previously isolated and described by him, this bark contains two other bases, *echitamine* and *echitenine*. The same three alkaloids are also found by him to occur in the bark of *Alstonia spectabilis*, together with a fourth base, first discovered in it by Scharlée, for which Dr. Hesse now proposes the name *alstonamine*. Australian *Alstonia* bark (*Alstonia constricta*), on the other hand, is shown to contain three bases distinct from those just mentioned; and for these he suggests the names *alstonine*, *porphyrine*, and *alstonidine*. An examination, by Mr. H. G. Greenish, of the root-bark of *Nerium odorum*, the sweet-scented oleander, reveals the presence therein of two closely allied non-nitrogenous, bitter principles, probably glucosides, both possessing the characters of powerful cardiac poisons. These he proposes to call *neriodorein* and *neriodorin*. Mr. L. H. Holden publishes the results of an analysis of the bark of *Aralia spinosa*, or false prickly ash bark, showing its bitter principle to be a glucoside. The tubers of *Scybalium fungiforme*, a Brazilian parasitic plant belonging to the *Balanophoraceæ*, have been examined by Dr. Peckolt, who announces the isolation from them of a crystallizable alkaloid, a crystallizable acid, and a peculiar bitter principle. Two crystalline poisonous principles, named *podophyllotoxin* and *picropodophyllin*, are reported by Dr. Podwyssotzki to have been isolated from podophyllum rhizome, together with podophyllic acid, a green oil, and an inert yellow crystalline substance resembling quercetin. The root of *Rhinacanthus communis* is shown to contain an active constituent resembling chrysophanic and frangulic acids in their antiseptic and antiparasitic properties. Messrs. C. R. A. Wright and E. H. Rennie describe a sweet crystallizable principle extracted by them from the leaves of *Smilax glycyphylla*, which are used in Australia as a remedy for scurvy and allied diseases.

In an elaborate report on the chemistry and pharmacy of ergot, M. Schmitt arrives at the conclusion that chemists are not yet properly acquainted with the active principles of this drug, and that not one of the bodies hitherto isolated from it can replace the drug as a therapeutic agent. He agrees with Bonjean and Buchheim in regarding the medicinal properties of ergot as due, not to

any one constituent, but to its entire chemical constitution. In his opinion preference should be given to powdered ergot over any of its preparations for internal administration, while he considers ergotine of Bonjean as the best form for hypodermic use.

The oil of ergot, which hitherto has been considered a useless waste product, is stated by Dr. Shoemaker to possess protective, soothing, and astringent properties, rendering it a valuable therapeutic agent in various skin diseases. The emollient properties of heavy paraffin oil are pointed out by Dr. Symes, who also calls attention to the suitability of this oil for a variety of pharmaceutical purposes.

Mr. E. G. H. Graff publishes the results of his experiments in the preparation of emulsions of oils, balsams, oleo-resins, resins, gum-resins, and seeds. In a paper on the preparation of syrups, Mr. G. H. C. Klie recommends a process of percolation for dissolving the sugar, on account of the more perfect clearness of the products, and their non-liability to crystallize. For the desiccation of narcotic extracts, Mr. W. Kirchmann proposes the addition of a definite proportion of anhydrous sodium sulphate; while another writer suggests the use of starch for the same purpose. Mr. E. B. Shuttleworth recommends an improved method for the preparation of liquor opii sedativus, consisting mainly in several successive repetitions of the B. P. process of preparing the liquid extract of opium.

Notwithstanding the care taken in the sifting of the past year's literature, and the rigid exclusion of unsuitable matter in the selection of the material for this work, the present *Year-Book* contains a larger number of abstracts than any of the previous volumes, occupying, however, considerably less than the usual space. It has been our special aim to effect this condensation without lessening the usefulness of the abstracts; and in this we trust to have succeeded. The large amount of matter has made it impossible, however, to allude to more than a small portion in this introductory chapter.

As a new feature of the book, we refer to the bibliographic section, which, we hope, will prove welcome to the reader.

CHEMISTRY.

YEAR-BOOK OF PHARMACY.

PART I. CHEMISTRY.

Hyoscine. A. Ladenburg. (*Ber. der deutsch. chem. Ges.*, xiii., 1549-1554.) The author has previously stated that hyoscyamine, the crystallizable alkaloid of *Hyoscyamus niger*, is accompanied by an amorphous base, which remains in the mother-liquor after the crystallization of the former. It is obtained from this mother-liquor in the form of a brown syrup, and may be purified by conversion into the aurochloride and subsequent regeneration. The name "hyoscine," which he gives to this new base, had previously been applied by him to a body obtained from hyoscyamine by the action of barium hydrate (see *Year-Book of Pharmacy*, 1880, p. 26); but as this body proved identical with tropine, the corresponding decomposition product of atropine, he now proposes to apply the name hyoscine to the second alkaloid naturally occurring in henbane. When hyoscine is acted upon by barium hydrate, it yields tropic acid and a base isomeric with tropine, for which the name "pseudotropine" is suggested.

The reactions of hyoscine are similar to those of hyoscyamine. Potassio-mercuric iodide produces a light yellow amorphous precipitate with acid solution of hyoscine, and mercuric chloride an amorphous precipitate. In its physiological action hyoscine resembles atropine.

The paper concludes with the following summary of the mydriatic alkaloids:—

1. Atropine, $C_{17}H_{23}NO_3$, splits up into tropic acid, $C_9H_{10}O_3$, and tropine, $C_8H_{15}NO$.
2. Hyoscyamine, $C_{17}H_{23}NO_3$, yields tropic acid, $C_9H_{10}O_3$, and tropine, $C_8H_{15}NO$.

3. Hyoscine, $C_{17}H_{23}NO_3$, splits up into tropic acid, $C_9H_{10}O_3$, and pseudotropine, $C_8H_{15}NO$.

4. Homatropine (a secondary product), $C_{16}H_{21}NO_3$, decomposes into amygdalic acid, $C_8H_8O_3$, and tropine, $C_8H_{15}NO$.

The three natural mydriatic alkaloids are therefore isomeric.

The Mydriatic Alkaloids. A. Ladenburg. (*Chemiker Zeitung*, 1881, No. 9.) So far as is known at present, only three mydriatic alkaloids occur naturally, viz., atropine, hyoscyamine, and hyoscine, all of which correspond to the formula $C_{17}H_{23}NO_3$. Atropine occurs in *Atropa Belladonna* and *Datura Stramonium*, hyoscyamine in *Atropa Belladonna*, *Datura Stramonium*, *Hyoscyamus niger*, and *Duboisia myoporoides*, and hyoscine in *Hyoscyamus niger*.

Duboisine is identical with hyoscyamine, and daturine appears to be a mixture of atropine and hyoscyamine.

The decomposition products mentioned in this paper are the same as those referred to in the preceding abstract.

Tropeines. A. Ladenburg. (*Ber. der deutsch. chem. Ges.*, xiii., 1081-1088.) This paper is a continuation of the author's previous report on a series of artificial alkaloids produced by the action of dilute hydrochloric acid on salts of tropeine (*Year-Book of Pharmacy*, 1880, p. 25). The bases of this kind now described by him are the following:—hydroxybenzoyltropeine, parahydroxybenzoyltropeine, orthohydroxybenzoyltropeine, benzoyltropeine, phthalyltropeine, atropyltropeine or anhydrotropeine, cinnamyltropeine, and oxytoluyltropeine or homatropeine. The last named alkaloid possesses mydriatic properties fully equal to those of atropine.

Synthesis of Tropic Acid. A. Ladenburg and L. Rügheimer. (*Ber. der deutsch. chem. Ges.*, xiii., 2041.) In a previous investigation the authors have established the close relation between hydropyridic, atrolactic, atropic, and tropic acids, and have shown that these acids may be successfully converted one into the other. They have now succeeded in producing atrolactic acid synthetically by treating acetophenone with phosphorus pentachloride, heating the resulting dichlorethylbenzol with alcoholic solution of potassium cyanide, distilling off the alcohol, boiling the residue with barium hydrate, then acidifying the product with hydrochloric acid, and purifying the acid thus separating by recrystallization. The resulting atrolactic acid can be converted into atropic acid by the action of hydrochloric acid, the product yielded in this manner being perfectly identical with atropic acid obtained from tropic acid. Atropic acid, as previously stated, is readily convertible into tropic acid; and the synthesis of tropic acid is thus fully accomplished.

Atropine. L. Pesci. (*Gazz. Chim. Ital.*, x., 425-430. From *Journ. Chem. Soc.*) The atropine was prepared from dry belladonna leaves by exhausting them with cold water, evaporating the extract at a gentle heat, and, after mixing the syrupy mass with soda solution, agitating with benzene to extract the alkaloid. The benzene solution was then agitated with dilute sulphuric acid, and the acid solution after addition of an alkali was in like manner agitated with chloroform. On mixing the chloroform solution with an equal volume of light petroleum (benzole), and allowing it to evaporate spontaneously, the liquid soon becomes filled with long colourless needles of pure atropine. The mother-liquors contain a small quantity of another alkaloid. Pure atropine, $C_{17}H_{23}NO_3$, melts at 106-108°. A table of its reactions is given: with picric acid it produces a yellow precipitate even in presence of sulphuric acid; with concentrated sulphuric acid no coloration in the cold, but a yellow tinge appears on heating; on adding water a pleasant odour of roses is evolved.

Atropine is not altered by boiling with a saturated solution of tartaric acid.

Action of Nitric Acid on Atropine.—If atropine is strongly heated with nitric acid, it yields picric acid; but if it is gradually added to fuming nitric acid, maintained at about 50°, it dissolves with a slight yellow coloration which subsequently disappears. On neutralising the product and extracting with ether, an oily base is obtained soluble in chloroform. With dilute sulphuric acid, it yields a crystalline sulphate having an odour of hawthorn; the sulphate is readily soluble in boiling water, but only sparingly in the cold. The *platinochloride* is crystalline, and, unlike that of atropine, is but sparingly soluble in hydrochloric acid. The *aurochloride* is a yellow amorphous precipitate, whilst that of atropine crystallizes readily in tufts of needles. There are also many other points of difference in its reactions from those of atropine. In its physiological effects, it does not cause dilation of the pupil, and it does not appear to be poisonous.

A New and Characteristic Reaction of Atropine and Daturine. Dr. D. Vitali. (*L'Orosi*, iii., 259.) The dry alkaloid is boiled for a few minutes with about ten times its quantity of nitric acid in a porcelain dish, and the heat then continued at a lower temperature until all free nitric acid is driven off. After cooling, a few drops of freshly prepared alcoholic solution of potash are allowed to run down the inner side of the dish. As soon as the alkaline solution touches the residue, a magnificent violet colour is developed, which

passes in a short time to wine-red and then to a muddy-red. The test is said to be a most delicate one. Strychnine, under the same conditions, produces a red, and brucine a greenish colour.

Combinations of Morphine with Alkalies and Alkaline Earths. P. Chastaing. (*Repert. de Pharm.*, June, 1881, 268.) Though morphine is a decided base, it exhibits in some instances the characters of an acid or a phenol. This is well seen from its combinations with lime, baryta, and potash, which the author has succeeded in producing. The two lime salts obtained and examined by him have compositions corresponding to the formulæ CaO , $(\text{C}_{17}\text{H}_{19}\text{N O}_3)_2 + 4\text{H}_2\text{O}$, and $\text{Ca} (\text{C}_{17}\text{H}_{18}\text{N O}_3)_2 + 2\text{H}_2\text{O}$. The morphinate of baryta is represented by the formula $\text{Ba O} (\text{C}_{17}\text{H}_{19}\text{N O}_3)_2 + 2\text{H}_2\text{O}$, and the potash salt by $\text{K}_2\text{O} (\text{C}_{17}\text{H}_{19}\text{N O}_3)_2 + 2\text{H}_2\text{O}$. The author gives $\text{K C}_{17}\text{H}_{18}\text{N O}_3 + \text{H}_2\text{O}$ as the probable formula of the true morphinate of potash, the existence of which he asserts though he has not yet been able to produce it.

Conversion of Morphine into Codeine. E. Grimaux. (*Comptes Rendus*, May 16th, 1881.) The colour-reaction of morphine with ferric chloride, and the solubility of this base in solutions of potash, lime, and baryta, are regarded by the author as indications of an approach to phenols in its characters. If morphine, therefore, be considered a phenol, codeine, differing from it in its composition by CH_3 , would appear to be its methylic ether, and likely, as such, to be obtainable from morphine. The author's experiments in this direction have proved successful. A solution of one molecular weight of morphine in alcohol containing one molecular weight of soda, when gently heated with one molecular weight of methyl iodide, yielded a small amount of codeine which, after purification, agreed in all its characters with codeine prepared from opium. Ethyl iodide, under the same conditions, yielded a new base, homologous with codeine, which may be regarded as the ethylic ether of morphine. A whole series of artificial bases may thus be prepared from morphine; and to these as a class he proposes to give the generic name of "codeines." "Codoethyline" would then be the new base just mentioned, while codeine itself would figure in this series as "codomethyline."

Morphine Hydrochlorate. Dr. O. Hesse. (*Liebig's Annalen*, ciii., 151.) When allowed to crystallize slowly from methyl alcohol, this salt is obtained in an anhydrous condition, in the form of small crystalline grains, which are soluble in 51 parts of methyl alcohol, and also sparingly soluble in ethyl alcohol. When recrystallized from water it forms the ordinary hydrated salt.

Strychnine. A. Claus and R. Glassner. (*Ber. der deutsch. chem. Ges.*, xiv., 773.) The authors point out that strychnine of commerce has not always the same composition, its formula being in some instances $C_{22}H_{22}N_2O_3$, and in others $C_{21}H_{22}N_2O_2$. This variation in composition is not regarded by them as due to the presence of impurities, but they believe that *Strychnos nux vomica* produces this alkaloid with a variable amount of carbon, a supposition which has also been entertained by Schützenberger.

The main part of the authors' paper is devoted to an account of some nitro-derivatives produced by the action of potassium nitrite on strychnine salts.

Chlorinated Derivatives of Strychnine. MM. Richet and Bouchardat. (*Comptes Rendus*, xci., 990.) The bodies prepared and described by the authors are monochlorinated strychnine, $C_{21}H_{24}ClN_2O_3$, and trichlorinated strychnine, $C_{21}H_{24}Cl_3N_2O_3$. The former of these is a weak base soluble in water, chloroform, ether, and alcohol, capable of combining with acids, and as poisonous as strychnine itself. The trichlorinated derivative is also soluble in ether and chloroform, but insoluble in water, and almost without physiological action. It does not combine with acids. The mode of preparation of these two bodies, as well as their reactions, are fully described in the paper.

Combination of Strychnine with Iodoform. M. Lextrait. (*Comptes Rendus*, xcii., 1057-1059.) The compound described by the author has a composition answering to the formula $C_{21}H_{22}N_2O_3 \cdot 3CH_2I_2$, and is obtained by dissolving 5 grams of crystallized iodoform and 12 grams of strychnine in 500 c.c. of alcohol of 85 per cent., allowing the mixture to stand in a closed vessel, then collecting the crystals formed on a filter, washing them with a small quantity of alcohol, pressing them between filter paper, and drying them without exposure to light or air. The compound is very unstable, being decomposed by light with the liberation of iodoform. It is also decomposed when heated to $90^\circ C.$, as well as by the action of boiling water or dilute acids. It is insoluble in water, but soluble in ether and chloroform. Alcohol partially decomposes it, and therefore cannot be used as crystallizing medium. Quinine appears to form an analogous compound, but the author only succeeded in obtaining it in a gelatinous form, containing an excess of quinine.

Brucine. W. A. Shenstone. (From a paper read before the Chemical Society, June 16th, 1881.) The author has extracted the alkaloids from 56 lbs. of *nux vomica*, with the precaution of avoiding

all heat in the presence of free acids or alkalis, and of employing as little heat as possible in the whole process. The yield of crystalline alkaloids was about 20 ounces. The brucine was purified by conversion into hydriodide, subsequent regeneration with sodium carbonate, etc. It was ultimately obtained quite free from strychnine. A number of combustions were made, with results agreeing with the formula $C_{23}H_{26}N_2O_4$. When treated with alcoholic soda, brucine was found to yield hydrobrucine, $C_{23}H_{28}N_2O_5$.

Besides strychnine and brucine, no other alkaloids could be detected in the seeds.

Characteristics of Aconitine and Allied Alkaloids. Dr. C. R. A. Wright. (*Pharm. Journ.*, 3rd series, xi., 2.)

Aconitine ($C_{33}H_{43}NO_{12}$, or $C_{26}H_{35}NO_7 \left\{ \begin{array}{l} (OH)_3 \\ O \cdot C \cdot O \cdot C_6H_5 \end{array} \right.$).—This alkaloid appears to be the chief, if not the only, active alkaloidal ingredient in the roots of *A. Napellus*, occurring therein together with amorphous alkaloids of lower molecular weight, and containing a higher percentage of carbon. From these alkaloids the free base partially separates by solution in ether and spontaneous evaporation, the ether being preferable previously mixed with very light petroleum spirit, as recommended by Duquesnel. If the amount of aconitine present relatively to the amorphous bases is not considerable, it is often impossible to get the former to crystallize at all (at any rate on the small scale); in any case a considerable amount of aconitine is retained in solution permanently by the agency of the amorphous alkaloids, which thus cause considerable loss, much as alkaline salts do in the case of sugar crystallization. Even after repeated crystallization from ether or ether-petroleum spirit, aconitine retains mechanically minute quantities of the amorphous bases, which, however, can be wholly eliminated by conversion into a salt, crystallization thereof, and regeneration of the alkaloid (by treatment with an alkali and crystallization from ether) from the salt thoroughly freed from the mother-liquor which contains the amorphous base as salt: the hydrochloride, hydrobromide, and nitrate are salts answering well for this purpose, especially the two last.

When perfectly pure, aconitine melts in a capillary tube at $183-184^\circ$ (corrected), the melting point being lowered by the presence of amorphous bases; the final complete melting is preceded by a slight fritting, beginning a few degrees below the melting point, and is accompanied by only very slight darkening with the pure base, by more if impure.

This test, together with the following, constitute the two simplest criteria of purity. The alkaloid to be examined is dissolved in a few drops of some dilute acid, some pure ether added, and then some sodium carbonate solution in excess, and the whole well agitated in a stoppered bottle; the ethereal solution is decanted and allowed to evaporate spontaneously; when only a small quantity is left this is decanted from the crystals that have formed into another vessel, and allowed to evaporate to dryness. If the aconitine were tolerably pure, the last drop of ethereal mother-liquor will dry up to crystals; but if more than minute quantities of amorphous bases were present, these will accumulate in the mother-liquor, the last portion of which will dry up not to crystals, but to a varnish or gum-like mass.

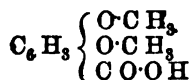
The gold salt of aconitine should not darken on drying over sulphuric acid in the dark (presence of amorphous alkaloids often causes decomposition to a small extent on drying); after desiccation, first over sulphuric acid till visibly dry, and finally in the water-bath, it should contain a trifle under 20·00 per cent. of gold (theoretical percentage, 19·92). If the base contains traces of amorphous alkaloids, the gold percentage is a little higher, specimens purified only by crystallization from ether generally containing 20·2–20·3 per cent. of gold.

On heating for some hours to 100° in a closed vessel with alcohol and a little caustic potash, aconitine should yield close to 19 per cent. of benzoic acid (theoretical percentage, 18·92) which can be extracted and estimated by evaporation of the alkaline fluid to dryness, solution in water, treatment with hydrochloric acid and ether, and spontaneous evaporation of the ethereal solution, with purification of the residue from resinous bye-products if necessary. The acid thus formed should not produce any substance capable of giving a green colour to ferric chloride on fusion at 250° with caustic potash, and treatment of the "melt" with hydrochloric acid and ether, and evaporation to dryness of the ethereal solution (indicates freedom from pseudaconitine).

Pure aconitine should contain close to the theoretical amounts of carbon and hydrogen, viz., 61·39 and 6·67 per cent. respectively. These analytical figures are the only reliable means of distinguishing aconitine from the closely allied alkaloid recently described under the provisional name "japaconitine," which agrees very closely with aconitine in all the other above-named points.

Pseudaconitine, $(C_{36}H_{49}NO_{13}, \text{ or } C_{27}H_{37}NO_5 \left\{ \begin{array}{l} (OH)_3 \\ O \cdot C_9H_9O_3 \end{array} \right\})$, the chief if not the only active ingredient in *A. Ferox* roots. Con-

siderably less easily crystallizable than aconitine; melting point when pure near to $104-105^{\circ}$ (not very distinctly marked, fritting commencing a few degrees lower), no darkening in colour accompanying the final fusion. No conclusions as to purity can be drawn from the incomplete crystallizability of the base (or its nitrate), as infinitesimal amounts of impurity, too small for analytical determination, and other circumstances, greatly affect the crystallising power. Should yield on "saponification" with alcoholic potash near to the theoretical amount of veratric (dimethylprotocatechuic) acid,



(viz. 26.49 per cent.), especially after purification of the acid formed from resinous bye-products; and should give analytical numbers near to the following theoretical values:—

| | | |
|----------------------------|---------|-------|
| Carbon in base (anhydrous) | . . . | 62.88 |
| Hydrogen in base | " . . . | 7.13 |
| Gold in Gold Salt | „ . . . | 19.10 |

Slightly higher percentages of gold being found (as with aconitine) when the base is only purified by crystallization from ether, and hence retains minute quantities of the amorphous bases occurring together with it in the roots.

Japaconitine ($\text{C}_{44}\text{H}_{88}\text{N}_2\text{O}_{21}$).—Provisional name applied to a base occurring in aconite roots (query as to species) recently imported into England from Japan. First examined by Paul and Kingzett, who attributed to it the formula $\text{C}_{29}\text{H}_{45}\text{N}\text{O}_9$. Exhibits very close similarity to aconitine, furnishing almost exactly the same amount of benzoic acid on saponification (theoretical percentage, 19.6), and melting at almost the same temperature, but slightly higher ($184-186^{\circ}$ instead of $183-184^{\circ}$ corrected). Crystallizes from ether just about as readily as aconitine, furnishes very similar salts, and can only be distinguished conveniently by analytical numbers, the theoretical values being uniformly higher than with aconitine, viz.:—

| | | |
|------------------------|-------|-------|
| Carbon in free base | . . . | 63.67 |
| Hydrogen in free base. | . . . | 7.07 |
| Gold in Gold Salt | . . . | 20.39 |

In a subsequent communication to the *Pharmaceutical Journal* (p. 148), Dr. Wright admits that a considerable amount of work is yet requisite before the question of the economical production of aconitine is definitely settled; but he points out that the questions now remaining to be solved are essentially of a pharmaceutical and

manufacturing nature, and as such somewhat out of the province of the scientific chemical investigator; these questions being simply the determination of the circumstances (as to soil, climate, age of plant, etc.) which influence the relative proportions between the crystallizable aconitine and the non-crystalline bases naturally accompanying it; so that the kind of plants most suitable for the extraction of the alkaloids may be known; and the elaboration of the best method of separating the crystallizable from the amorphous substances on the large scale.

Researches on Jaborandi. E. Harnack and H. Meyer. (*Liebig's Annalen*, cciv., 67-84.) The authors claim to have established the presence of a second alkaloid in jaborandi leaves, by extracting from commercial pilocarpine an alkaloid distinct from pilocarpine. This new alkaloid they propose to name "jaborine." It is described as a very strong base, distinguishable from pilocarpine by its slight solubility in water and its greater solubility in ether, and also by its different physiological action. While the action of pilocarpine is said to be somewhat analogous to that of nicotine, jaborine is asserted to correspond closely in its action to atropine. Jaborine volatilizes with difficulty at high temperatures. Its salts are soluble in water and alcohol, and do not crystallize. The authors believe the formula of jaborine to be either the same as that of pilocarpine, or to be closely related to it.

For pilocarpine the authors give the formula $C_{11}H_{16}N_3O_3$, as deduced from their analyses of its aurochloride and platinochloride. This formula, however, does not agree with the one previously assigned to it by Kingzett (see *Year-Book of Pharmacy*, 1877, p. 615).

A full account of the process by which jaborine was extracted from commercial pilocarpine will be found in the original paper.

The Alkaloid of Jaborandi. C. T. Kingzett. (*Pharm. Journ.*, 3rd series, xi., 587.) Referring to Harnack and Meyer's assertion of the existence of a second base in jaborandi (see the foregoing article), the author thinks that these chemists have not adduced sufficient evidence of the existence in true jaborandi of two distinct alkaloids. The method employed by him for the isolation of pilocarpine was such that the resulting product would contain the entire amount of base present in the plant, and its examination furnished no reason for believing it to contain more than one substance. Further, its ultimate analysis gave results concordant with those obtained by similarly analysing the well-crystallized chloroplatinate. He, therefore, feels still convinced that jaborandi contains only one alkaloid, but admits the possi-

bility of its being found to exist in two states, such as many other bases are known to assume.

As regards the formula of *pilocarpine*, Mr. Kingzett sees no reason for abandoning the one he originally assigned to it. His analysis of the free base was conducted with all the refinements of the best methods; and a combustion in *vacuo* with cupric oxide and metallic copper furnished carbonic anhydride and nitrogen in such quantities as showed the relation of carbon to nitrogen to be as 1 : 6, a requirement which the formula of Harnack and Meyer does not satisfy or explain.

The molecular weight of the chloroplatinate calculated from the proportion of platinum found by analysis was 842, which corresponds exactly to the formula $C_{23}H_{34}N_4O_4 \cdot 2 H Cl. Pt Cl_4$.

The analysis of the free base as well as of the chloroplatinate led to $C_{23}H_{34}N_4O_4$ as the simplest formula for pilocarpine. Harnack and Meyer arrive at $C_{11}H_{16}N_2O_2$ or $C_{22}H_{33}N_4O_4$, showing an apparent difference of CH_2 in the two larger formulæ. Until further investigations settle the point in dispute the author is determined to adhere to his own formula.

The Alleged Presence of a Second Alkaloid in Jaborandi. A. W. Gerrard. (*Pharm. Journ.*, 3rd series, xi., 608.) The author agrees with Kingzett (see the foregoing article) that Harnack and Meyer's research has not established the presence of a second alkaloid in jaborandi or pilocarpine. These gentlemen are stated to have prepared their new alkaloids from mixed residues obtained from jaborandi leaves and false jaborandi (*Piper reticulatum*). These, however, are two distinct plants of different natural orders, the latter of which no investigation has yet shown to contain pilocarpine; it is, therefore, obvious that experiments upon such a mixture are of doubtful value.

As another inconsistency, the writer points to the fact that in one part of their paper Harnack and Meyer speak of jaborine as contained in jaborandi leaves, while in another part they state that fluid extract of jaborandi is free from jaborine, but that jaborine is produced on evaporating the acidified alcoholic solution.

Pilocarpine. A. Poehl. (*Bull. de la Soc. Chim.* [2], xxxiv., 340.) The author has made analyses of pure pilocarpine as well as of its hydrochlorate and its platinochloride. His results confirm the correctness of Kingzett's formula, $C_{23}H_{34}N_4O_4$. The alkaloid was prepared by digesting jaborandi leaves in water containing 1 per cent. of hydrochloric acid, treating the infusion with lead acetate, filtering, precipitating the alkaloid from the filtrate by

phospho-molybdic acid, washing the precipitate with dilute hydrochloric acid, and finally decomposing it by means of baryta at a temperature below 100° C.

Aspidospermine and Paytine. Dr. N. Wulfsberg. (*Pharmaceut. Zeitung*, 1880, 546.) The alkaloid paytine was discovered by Dr. O. Hesse in 1870 in a white bark of unascertained botanical origin. This bark, known as *cortex chinæ albæ de Payta*, was found by Prof. Flückiger to agree in its anatomical structure with the cinchona barks, but was subsequently ascertained by him not to be a *Cinchona*, nor a member of the Rubiaceæ. The author of the present paper, who has recently examined this bark, finds it to correspond so closely with white quebracho bark as to lead him to the conclusion that it is derived from a species of *Aspidosperma*. He further finds that the alkaloids paytine and aspidospermine show so close an agreement in their general characters and chemical reactions, as published by Hesse and Fraude respectively, and also in the numbers obtained by analysis, that he considers their identity as in the highest degree probable.

The Alkaloids of White Quebracho Bark (*Aspidosperma Quebracho*). Dr. O. Hesse. (*Ber. der deutsch. chem. Ges.*, xiii., 2308.) The author has satisfied himself that Wulfsberg's assertion concerning the identity of Fraude's aspidospermine (from *Aspidosperma Quebracho*) and Hesse's paytine (from white paytine bark) is incorrect. The investigation leading him to this conclusion has also revealed the existence in quebracho bark of a second alkaloid, which he proposes to call *quebrachine*. This substance is deposited from an alcoholic solution in white prisms, sparingly soluble in ether, and fusing at 214° C. with partial decomposition. Its formula is $C_{31}H_{26}N_2O_3$. It is a strong base capable of neutralizing acids. The sulphate forms four-sided prisms soluble in alcohol and water. The hydrochlorate also crystallizes in prisms which are sparingly soluble in cold, but readily so in hot water. The solution of the alkaloid in pure sulphuric acid has a blue colour, which is greatly intensified by the addition of lead peroxide or potassium bichromate. In these and other reactions it somewhat resembles strychnine and curarine, but differs from these in its action upon frogs.

Quebrachine possesses toxic properties. A dose of 0.04 gram proved sufficient to kill a small rabbit.

Dr. Hesse states that quebracho bark contains, besides aspidospermine and quebrachine, several other alkaloids upon which he promises to report in a subsequent paper.

Alleged Identity of Paytine and Aspidospermine. P. N. Arata.

(*Journ. Chem. Soc.*, 1881, 622.) Wulfsberg having stated that paytine, an alkaloid found in a white cinchona bark from Payta, in Peru, is identical with aspidospermine from the bark of *Aspidosperma Quebracho*, the author points out that the alkaloids obtained from these two sources differ somewhat in composition (the platino-chloride of paytine containing 18.73 per cent. platinum, whereas that of aspidospermine contains only 17.45 per cent.), and vary considerably in some of their properties and reactions.

These differences are shown in the following table:—

| Paytina. | Aspidospermine. |
|---|---|
| Easily soluble with 1 mol. H_2O . | White prismatic crystals, with brilliant faces. |
| Easily soluble in ether, benzene, chloroform, alcohol, and light petroleum. | Soluble in 48 parts alcohol, and in 106 parts of ether; insoluble in light petroleum. |
| Slightly soluble in water. | One part dissolves in 6,000 parts of water. |
| Melts at 156° . | Melts at $205-206^{\circ}$. |
| Heated above its melting point, it gives off an oily distillate and leaves a carbonaceous residue. | Heated above its melting point, it decomposes partially, giving off an odour which resembles acrolein, and provokes sneezing. |
| Heated with caustic soda, it yields a nonazotized sublimate, viz., paytine, which condenses in colourless laminae and needles. | Heated with an alkali, it exhibits the coloration of the pyridine and quinoline bases. |
| Dissolves in strong nitric acid, forming a liquid nearly colourless at first, but afterwards becoming garnet-red, and finally yellow. | With nitric acid it instantly produces a red-violet colour, which is persistent. |
| Not coloured by ferric chloride, or by strong sulphuric acid. | Sulphuric acid produces in solutions of aspidospermine a wine-red coloration, which disappears after some hours. |
| Mercuric chloride forms an amorphous yellow precipitate. | Precipitated by mercuric chloride in white tufts. |
| Auro-chloride: Purple precipitate, the supernatant liquid exhibiting the same colour. | Deep blue coloration. |
| The hydrochloride, hydrate, and nitrate are crystallizable, the sulphate, chromate, oxalate, and picrate are not. | No crystallizable salts. |

Estimation of Nicotine in Tobacco. E. T. Pease. (*Journ. Amer. Chem. Soc.*, July, 1880.) The author's estimations of nicotine in leaf and manufactured tobacco were made by titration with Mayer's solution (potassio-mercuric iodide), as directed by Dragendorff (*Werthbestimmung einiger starkwirkenden Drogen*, 1874, 52).

The tobacco was first dried, the portion weighed, then macerated for at least twenty-four hours with water acidulated with sulphuric acid, and the expressed liquid concentrated and filtered. The solution from 2 to 3 grams of tobacco was brought to 50 c.c., and of this 10 c.c. were taken for titration. The end of the reaction was found by filtering a few drops through a very small filter, trying the filtrate on a watch-glass with a drop of the volumetric reagent, and rinsing the filter into the whole solution. The best solution employed contained $\frac{1}{10}$ of a molecular weight of mercuric iodide (made from $\text{Hg Cl}_2 + 6 \text{ K I}$).

The precipitate first obtained appears milky when formed, but soon turns black and waxy, and settles to the bottom in a coherent mass. Several of the operations were duplicated, with but very slight differences in results. The end of the precipitation is sharply defined.

The six samples of cigars and tobacco thus examined gave the following percentages: 2.00, 4.05, 3.24, 4.21, 3.94, and 3.93.

A short clay pipe, some time in use and partly coloured, was pulverized, macerated in acidulated water, and the solution treated as from tobacco. The result of titration, if due to nicotine, indicated 0.4779 gram of that alkaloid. The pipe weighed 23.619 grams; therefore 2.02 per cent. of alkaloid was indicated.

The alkaloid was also estimated in tobacco smoke, and found to amount to 2.48 per cent. of the tobacco burned. The author suspects, however, that this result may be too high, owing to the possible action of the empyreumatic products on the test-solution.

Nicotine Derivatives. A. Cahours and A. Etard. (*Comptes Rendus*, xc., 275-280, and *Journ. Chem. Soc.*, 1880, 672.) When thiotetrapyridine, $\text{C}_{20}\text{H}_{18}\text{N}_4\text{S}$, obtained by the action of sulphur on nicotine (*Ibid.*, lxxxviii., 999, and *Year-Book of Pharmacy*, 1880, p. 40), is boiled with dilute nitric acid, it gives nicotinic acid (m. p. 228-229°).

Thiotetrapyridine when distilled with finely divided metallic copper loses sulphur, and yields a base, isodipyridine, $\text{C}_{10}\text{H}_{10}\text{N}_2$, isomeric with dipyridine, but differing greatly from it in its properties. It is also produced in small quantity by the action of alcoholic potash on thiotetrapyridine at 200°. Isodipyridine is a

colourless oil (b. p. 274–275°), having an odour somewhat resembling that of certain mushrooms. It does not solidify at -20° , and its sp. gr. at 13° is 1.1245. It is insoluble in cold, and only sparingly soluble in boiling water, but easily in alcohol or ether. It unites energetically with hydrochloric acid, but the hydrochloride does not crystallize. The *platinochloride* $(C_{10}H_{10}N_2HCl)_2PtCl_4 + 2H_2O$, crystallizes in deep orange plates of the colour of potassium dichromate. It is decomposed if boiled with water.

It was thought probable that if nicotine were submitted to limited oxidation it might yield isodipyridine, thus: $C_{10}H_{14}N_2 + O_2 = C_{10}H_{10}N_2 + 2H_2O$. For this purpose pure nicotine was dissolved in dilute potash solution, and oxidized with potassium ferricyanide, and the product distilled. The bases extracted from the distillate by means of ether, when submitted to fractional distillation, were found to consist of isodipyridine with unaltered nicotine.

If nicotine in the state of vapour is passed over red-hot porcelain, it is in part decomposed (about 20 per cent.), yielding a gaseous mixture of hydrogen with paraffins and olefines, and a liquid product containing pyridine, picoline, collidine, and new basic substances boiling at temperatures above 250° .

A Bromo-derivative of Nicotine. A. Cahours and A. Etard, (*Comptes Rendus*, xc., 1315–1317. From *Journ. Chem. Soc.*) One part of nicotine is dissolved in 50 parts of water, and 2 molecules of bromine added for every molecule of nicotine. A yellow flocculent resinous-looking precipitate falls, which, together with the mother-liquor, is heated gently to 65 – 70° , more bromine being added if required. The whole is then filtered and allowed to cool, when an abundant crystallization of the bromo-derivation takes place. The undissolved portion treated separately with water at 70° yields a crystalline deposit similar to the preceding.

The crystals are in the form of red needles often more than 1 mm. in length, and are similar in colour to potassium bichromate. They are unalterable in the air, but are decomposed by water at a temperature higher than 70° . When dissolved in concentrated hydrobromic acid, they assimilate a molecule of HBr , forming the hydrobromide of the original derivative.

Analysis showed that the formula of the bromo-derivative is $C_{10}H_{14}N_2Br_4$. Huber's pentabromide is therefore probably the hydrobromide above mentioned, but the formula given to it by Huber contains three atoms less of hydrogen.

The tetrabromo-nicotine is decomposed and destroyed by an aqueous solution of potash.

Bromine Derivatives of Nicotine. R. Laiblin. (*Ber. der deutsch. chem. Ges.*, xiii., 1212-1214. From *Journ. Chem. Soc.*) By the action of bromine and water on nicotine in sealed tubes at 120-150°, the author has obtained a crystalline compound similar to that obtained by Cahours and Etard, which is probably $C_{10}H_{13}Br_2N_2 + HBr$. On treatment with potash it yields nicotine.

Bromonicotine, $C_{10}H_{13}N_2Br_2$.—For the preparation of this compound the author recommends the following method, instead of Huber's (*Annalen*, cxxxi., 257), which does not yield very good results. To 50 grams of bromine and 30 grams of water is added a solution of 16 grams of nicotine in 20 grams of water in small quantities at a time, the temperature not being allowed to rise above 50-60°. The whole is warmed on a water-bath until the oil so formed is dissolved, and then 60-70 grams of water are added; on cooling a crystalline body separates out, probably the compound $C_{10}H_{13}Br_2N_2 \cdot 2HBr$. This is decomposed by aqueous ammonia, and yields bromonicotine. The author is at present engaged in the study of the oxidation-products of this body.

Conine, and some of its Salts. Prof. A. W. Hofmann. (*Ber. der deutsch. chem. Ges.*, xiv., 705.) The results of careful analyses of this alkaloid and of its hydrochlorate and hydrobromate have convinced the author that the formula, $C_8H_{15}N$, generally accepted for this base, ought to be replaced by $C_8H_{17}N$. This corrected formula disposes of the supposed identity with conine of several artificial products of the formula $C_8H_{15}N$.

The hydrochlorate, $C_8H_{17}N \cdot HCl$, is obtained as a brilliant white crystalline mass by dissolving conine in anhydrous ether and treating the solution with dry hydrochloric acid gas. It is very soluble in water and alcohol, but insoluble in ether, and can be heated to 100° C. without suffering decomposition.

The hydrobromate, $C_8H_{17}N \cdot HBr$, is formed under the same conditions as the hydrochlorate, if HBr be used in the place of HCl . It may also be readily prepared by adding bromine drop by drop to a solution of conine in anhydrous ether, as long as the bromine continues to be decolorized. The salt thus separates as a crystalline mass, while a substitution product of conine remains dissolved in the ether. In its behaviour towards solvents and heat it corresponds to the hydrochlorate.

The Alkaloid from Pituri. Prof. Liversidge. (Abstract of a paper read before the Royal Society of New South Wales, November 3rd, 1880. *Pharm. Journ.*, 3rd series, xi., 815-818.) In the preparation of the alkaloid by the author the pituri was extracted with

boiling water slightly acidified with sulphuric acid, the liquid concentrated by evaporation and distilled with an excess of caustic soda, the alkaline distillate neutralized by hydrochloric acid, and evaporated over a water-bath until reduced to a small bulk; the yellowish residue was once more distilled with caustic soda, the distillate neutralized with hydrochloric acid, and again concentrated. It was now nearly colourless, caustic soda was again added, and the liquid shaken up with ether. The ether was next removed by distillation at as low a temperature as possible in a current of hydrogen, the heat meanwhile being raised gradually until it reached 140°C ., a bath of sulphuric acid being used for this purpose. It was allowed to remain at this temperature for about six hours; the bath was then removed, and the distillation continued at a still higher temperature over a naked flame, the current of hydrogen being still maintained, until all the alkaloid, with the exception of a very small quantity, which had become charred, had passed over in a clear and colourless condition. During the distillation the thermometer indicated a temperature between 243° and 244°C .

Sixty grams of the substance gave .622 gram of the alkaloid, or 1.037 per cent. In this case the alkaloid was not allowed to boil, but was maintained at a temperature of 140°C . in a current of hydrogen for several hours, to remove water and traces of ammonia. In a second experiment 500 grams of the pituri gave 12.34 grams of alkaloid, or 2.47 per cent., when distilled in a current of hydrogen. The pituri did not contain any non-volatile alkaloid.

The alkaloid when freshly prepared is clear and colourless, but with access of air rapidly becomes yellow, and finally brown, especially when exposed to sunlight. In a sealed tube one specimen remained unchanged during eight months. It is soluble in all proportions of water, alcohol, and ether, yielding colourless solutions. On paper it produces a greasy stain, which disappears after a time. It is just a little heavier than water, a little drop of it sinking slowly to the bottom of a vessel of distilled water.

When freshly prepared its smell is very like that of nicotine; afterwards, when darkened in colour and thickened in consistency, the odour is more like that of pyridine. It is volatile at ordinary temperatures, its vapour forming a dense fog with hydrochloric acid. Its vapour irritates the mucous membranes very much, and when working with it induced violent headaches. The taste is acrid and pungent, and very persistent.

The alkaloid neutralizes acids completely; but the neutral solutions of acetate, sulphate, and hydrochloride all become acid on

evaporation from the loss of alkaloid. Oxalic acid is the only acid which yields a crystalline salt; but this is more or less mixed with free acid, from the loss of alkaloid by volatilization, an acid salt mixed with free oxalic acid being left. The acetate, sulphate, and hydrochloride, when kept over strong sulphuric acid, dry up into hard, brittle, transparent, varnish-like substances, without the slightest trace of crystallization, even after standing for months. All these compounds are very hygroscopic, especially the sulphate, and are very readily soluble in alcohol.

Neither concentrated hydrochloric acid nor nitric acid changes the colour of the alkaloid in the cold, but when warmed, hydrochloric acid imparts a slightly reddish colour, and nitric acid turns it yellow. Concentrated sulphuric acid turns it brown after some time, immediately when warmed.

Plutinic chloride does not precipitate an aqueous solution of the alkaloid (1·100 aq.) so long as the alkaloid is in excess, but when the solution has become neutralized the addition of another drop of platinic chloride throws down a slight yellowish flocculent precipitate, which dissolves on heating, but does not reappear on cooling; if a larger quantity of the platinic chloride be added, the precipitate still dissolves on the application of heat, but on cooling reappears in a crystalline condition.

In a solution of 1 part of the hydrochloride of the alkaloid to 50 of water, a precipitate similar to the above is thrown down, and if heated, a part re-dissolves, the undissolved portion turns to an orange-yellow colour and becomes crystalline—the dissolved salt also crystallizes only on cooling. Under the microscope the crystals appear to have the form of the octahedron, or combinations of that with other forms belonging to the cubical system. More dilute solutions of the hydrochloride are not precipitated by platinic chloride.

In an aqueous solution of 1 part of the alkaloid to 100 of water,—

Mercuric chloride throws down a white cheesy precipitate insoluble in excess of the precipitant.

Copper sulphate a light green precipitate insoluble in an excess of the alkaloid.

A few drops of gold chloride give a reddish white precipitate, which disappears on shaking; a larger quantity gives a persistent flocculent reddish white precipitate.

Tannic acid gives a greyish white precipitate, easily soluble in hydrochloric acid.

The double iodide of mercury and potassium gives a heavy white crystalline precipitate.

The alkaloid behaves very like nicotine with picric, phosphomolybdic, and metatungstic acids; the addition of picric acid throws down a yellow precipitate soluble in hydrochloric acid.

Phosphomolybdic acid forms a yellowish white amorphous precipitate, insoluble in cold dilute hydrochloric acid, easily and completely dissolved on warming. The precipitate with nicotine is a dirty yellowish white, amorphous, insoluble in cold dilute hydrochloric acid, soluble when warmed, but apparently not so readily as is the precipitate from the pituri alkaloid, some white flakes being left undissolved.

Metatungstate of sodium forms, with both piturine and nicotine, a white amorphous precipitate, soluble only in much dilute hydrochloric acid when warmed.

When iodine dissolved in ether is added to an ethereal solution of the alkaloid, the fluid becomes brownish red and turbid; after a short time yellowish red needles are deposited, the mother-liquor being yellow; these crystals are easily soluble in alcohol, yielding a brownish red solution; when the alcoholic solution is evaporated at the ordinary temperature, indistinct needles and oily drops are left behind.

When this alcoholic solution is treated with caustic soda in the cold, a smell similar to that of iodoform is emitted, not that of the alkaloid; from the nicotine compound nicotine is liberated, according to Wertheim (Watt's "Dictionary of Chemistry," iv., p. 47).

The iodine compound of pituri melts at about 110°C ., that of nicotine at 100°C .

From conine piturine is distinguished by its aqueous solution not becoming turbid on heating nor by the addition of chlorine water. It differs from aniline by not being coloured by chlorinated lime; it differs from picoline in specific gravity (picoline being only $\cdot 9613$ at 0°C); from pyridine by its reaction with copper sulphate, the precipitate $\text{Cu}(\text{OH})_2$ produced by pyridine with copper sulphate redissolves in an excess of the precipitant; and it appears to be distinguished from nicotine by its reactions with platinic chloride, gold chloride, and iodine and mercuric chloride, also by Palm's test. According to the latter, nicotine, when gently warmed with a little hydrochloric acid of $1\cdot12$ sp. gr., turns violet, and on the addition of a little strong nitric acid the colour changes to a deep orange. Piturine, thus treated, does not change colour at all, but when more heat is applied it becomes yellow.

These results completely disprove M. Petit's statement that the alkaloid of pituri is identical with nicotine (*Year-Book of Pharmacy*, 1879, p. 98).

The number obtained by the author in eight combustions of piturine lead to the formula C_9H_8N . From the results of analysis of the mercuric chloride double salt, however, he feels inclined to double that formula, or $C_{18}H_{16}N_2$, as probably the more correct representation of the composition of the alkaloid.

Behaviour of Berberine towards Thymol. J. U. Lloyd. (*New Remedies*, 1881, 195.) The author observed that berberine, prepared from *Hydrastis canadensis*, when mixed with an equal weight of thymol, yielded a viscid liquid, though both the thymol and berberine were used in the form of dry powders. The berberine had been exposed to warm air in a drying closet, whereby most of its water of crystallization was expelled. The cause of this liquefaction remains to be investigated.

Estimation of Theine in Tea. M. Patrouillard. (*Correspondenz Blatt des Ver. Analyt. Chem.*, 1880, No. 14.) 15 grams of tea are repeatedly extracted with boiling water until exhausted. The filtered decoctions are evaporated to the consistence of an extract, then mixed with 2 grams of calcined magnesia and 5 grams of powdered glass, and further evaporated to perfect dryness. The finely pulverized residue is treated with 60 c.c. of ether four successive times, after which the united ethereal solutions are allowed to evaporate. The theine thus left is redissolved in a little chloroform, and the solution allowed to evaporate in a weighed dish. Care must be taken not to use too little ether, since theine is only slightly soluble therein.

Caffeine and Theobromine. MM. Malay and Hinteregger. (*Monatshefte für Chemie*, ii., 87 and 126.) The authors have studied some oxidation compounds of these two bases with the object of throwing further light on their relation to each other. By oxidation with chromic acid, caffeine yielded dimethylparabanic acid, $C_8H_8N_2O_3$, while theobromine under the same treatment was found to yield methylparabanic acid, $C_7H_8N_2O_3$, the difference (CH_2) between the two products being the same as that between the two alkaloids themselves.

Caffeine and Caffeidine. Dr. E. Schmidt. (*Ber. der deutsch. chem. Ges.*, 1881, 813-817.) The author describes some unsuccessful attempts to convert caffeine, $C_8H_{10}N_4O_2$, into theobromine, $C_7H_8N_4O_2$, by withdrawing methyl groups by means of hydrochloric acid. Similar attempts to convert caffeine into xanthine or decomposition products thereof likewise proved unsuccessful.

Definite salts of caffeine could only be produced by the direct action of acids upon the base in concentrated solutions. The salts

described by the author are two hydrochlorates, two hydriodates, the hydrobromate, nitrate, sulphate, aurochloride, platinochloride, acetate, butyrate, and isovalerianate. The citrate and formate are said not to exist.

Caffeidine, $C_7H_{13}N_4O$ was prepared by boiling one part of caffeine with a solution of ten parts of crystallized barium hydrate. After removing the excess of baryta by dilute sulphuric acid and evaporating the acid filtrate to the consistence of a thin syrup, sulphate of caffeidine was obtained in needle-shaped crystals answering to Strecker's formula, $C_7H_{13}N_4O \cdot H_2SO_4$. The free base is an oily strongly alkaline liquid, rapidly soluble in water, alcohol, and chloroform, but difficultly soluble in ether, and agrees in these and all other respects with Strecker's statements. Besides the sulphate, several other salts of caffeidine and of some of its ethyl-derivatives are described in this paper.

Caffeine. E. Fischer. (*Ber. der deutsch. chem. Ges.*, xiv., 637-644.) This paper contains an account of an examination of bromocaffeine and some other derivatives of this alkaloid, undertaken with the object of deciding between the constitutional formulæ for caffeine proposed by Medicus and by Strecker. From the results of his investigation the author considers the constitutional formula given by Medicus as the more probable one of the two.

Citrate of Caffeine. J. U. Lloyd. (*New Remedies*, February, 1881.) Previous researches by Hager and Haarmann tend to show that the so-called citrate of caffeine of commerce is not a chemical combination, but a mixture containing both the alkaloid and the citric acid in a free state, and that caffeine does not combine either with citric or with valerianic acid (see *Year-Book of Pharmacy*, 1878, p. 91).

The question which the author set himself to solve was, whether or not it was possible to obtain citrate of caffeine as a definite chemical compound. All endeavours to make citric acid and caffeine combine in aqueous or alcoholic solutions proved failures, as the products thus obtained, when treated with chloroform, yielded free caffeine to the latter, leaving citric acid undissolved. Attempts to produce citrate of caffeine by double decomposition from barium citrate and solution of caffeine in water acidulated with sulphuric acid, led to no better result. Further experiments convinced him that in order to make the alkaloid and acid combine, a menstruum must be used which will exert an equal or nearly equal solvent action on both the caffeine and citric acid. A mixture of 2 parts of chloroform and 1 part of alcohol was found to answer for this

purpose. The mode of procedure finally adopted is as follows:—Dissolve 30 grains of caffeine in one fluid ounce of chloroform, and mix this with a solution of 30 grains of crystallized citric acid in half an ounce of alcohol. Filter if necessary, and evaporate the filtrate in an evaporating basin over a water-bath until the residue is of a syrupy consistence. Remove the dish, then cool to 50° F., rubbing the contents of the dish with a spatula, and continue until a dry powder results. This is mostly citrate of caffeine, but free citric acid and free caffeine are undoubtedly present to some extent.

The preparation thus obtained is described as a semi-crystalline granular powder, which is decomposed both by water and alcohol. Cold chloroform dissolves from it any free caffeine it may contain, but exercises no solvent action on the compound.

The conclusion arrived at by the author is that citrate of caffeine is a definite compound, and that this is decomposed by solvents which, like water and alcohol, dissolve citric acid readily and caffeine sparingly. It is easily obtained by the process described, always however contaminated with some free caffeine and free citric acid.

The Testing of Quinine Sulphate. G. Kerner. (*Journ. Chem. Soc.*, Feb., 1881.) The author described in 1862 the "ammonia-method" for testing the purity of commercial sulphate of quinine: the method has been adopted very widely. The present paper contains a fuller account of his process, together with criticisms on a method proposed by Hesse.

Hesse's process resembles the author's in not detecting less than 1 per cent. of cinchonidine sulphate, but from published results it appears to yield only an approximate estimation, whereas the ammonia-method as now described yields numbers of almost absolute accuracy. After stating his reasons for considering Hesse's process unsatisfactory, the author describes the ammonia-method with recent improvements.

The "ammonia-method" depends on the facts that a cold, saturated solution of quinine sulphate contains an invariable quantity of the alkaloid, and that the quantity of ammonia required to redissolve this precipitate is also constant. If the quantity of ammonia necessary to form the precipitate, and to redissolve it, has been determined in a known volume of pure quinine sulphate solution at normal or known temperatures, the excess of ammonia required for the same quantity of a saturated solution of commercial quinine sulphate gives the means of calculating the quantity of associated alkaloids, of which cinchonidine alone is usually present. Since quinine readily alters by becoming mouldy, and ammonia solution

also alters in strength by keeping, it is best to prepare a solution of pure quinine solution for each estimation, and titrate with it the ammonia to be used.

Pure Quinine Sulphate.—It is often necessary to recrystallize from three to six times, with addition of several drops of sulphuric acid in excess, in order to get rid of the last traces of cinchonidine. The purity can be tested by treating portions with different proportions of cold water, and titrating the solutions with ammonia. Solutions of commercial samples require different amounts of ammonia when the proportion of solvent to solid has been varied; but when pure, variations of solid to solvent between 1 : 10 and 1 : 700 produce no alteration in the quantity of ammonia required, and the excess of solid remaining undissolved in making the solutions yields also solutions of precisely the same ammonia titre.

Preparation of Solutions and Process of Titration.—The pure quinine sulphate prepared as above is rubbed into a homogeneous paste with water in a mortar and rinsed into a stoppered vessel, in which it is frequently agitated during from twelve to eighteen hours: the proportion of quinine to water used being about 1 : 100. To prepare the solution of the sample to be tested, 5 grams are similarly treated with 50 c.c. of water. The vessels containing the quinine solutions and the vessel containing the ammonia solution (of 0.92 sp. gr.) are placed in cold water, and as soon as their contents have reached the same temperature, the quinine solutions are filtered through dry filter-papers. The temperature need not be normal, provided both quinine solutions are prepared at the same temperature. The undissolved pure quinine is dried and kept for future use.

10 c.c. of each of the quinine solutions are then measured off into test-tubes, and each is titrated with the ammonia solution; 5 c.c. of ammonia solution are run in, the test-tube is closed with the finger, and its contents are mixed by several times inverting without shaking it. The quinine is thus precipitated and almost entirely redissolved, the liquid remaining but slightly turbid; by gradually dropping in ammonia, mixing, and waiting several seconds after each addition, the moment when the liquid becomes perfectly clear is easily noted. The excess of ammonia required gives the quantity of cinchonidine sulphate present; on an average, 0.288 c.c., or roughly, 0.3 c.c., of ammonia solution of 0.92 sp. gr. were found to correspond to 1 mgrm. of crystallized cinchonidine sulphate. The error in the process cannot exceed 0.05 per cent.

It must be understood that this process is only directly applicable to samples which answer to the qualitative ammonia test, and which

contain not more than 1.5 per cent. of cinchonidine sulphate; if more than 2 per cent. is present, the final reaction cannot be obtained, since either insoluble flocks appear, or the solution gelatinizes when near the clarifying point: if from a preliminary qualitative test the nature or intensity of the turbidity renders it probable that 2 per cent. or more is present, the solution to be titrated may be prepared as directed above, and then be diluted with known quantities of the pure quinine solution, or larger proportions of water to quinine may be employed in making the solution; in the latter case, it is better to warm during the process of solution.

It is noted that chemically pure quinine hydrate crystallizes out from the titrated solution on standing.

An approximate estimation of the cinchonidine sulphate can be made by introducing 5 c.c. of the water extract (1 : 10, prepared at 15° C.) into a 10 c.c. cylinder graduated to tenths of a c.c., and adding 3 c.c. of ammonia of 0.92 sp. gr. On mixing by inversion, the liquid will usually remain very turbid; ammonia is then gradually added with constant mixing until the liquid becomes perfectly clear, and the total volume of ammonia added is read off. Assuming that 5 c.c. of ammonia indicate 1 per cent. of cinchonidine sulphate, and 3 c.c. indicate none, the percentage can be ascertained. This method gives with great accuracy relative values for quinine samples examined under similar conditions. This method is sufficiently accurate for practical purposes, the former more exact method being resorted to for disputed cases and for scientific purposes only.

Quinidine is seldom present, except as an adulterant purposely added; it dissolves somewhat more readily in excess of ammonia than cinchonidine does.

The percentage of water, present as water of crystallization or otherwise, is of considerable importance, both for commercial reasons and to ensure the correctness of quantities of the alkaloid used as doses. The presence of a small quantity of sulphuric acid tends to promote crumbling of the crystals with loss of their water of crystallization, whilst a small amount of uncombined water tends to prevent this change. Uncombined water is estimated by the difference between the quantities of water found on drying a portion of the original sample and another portion which has been pressed between soft blotting-paper. The author, after a long experience in estimating water in quinine, considers that in the crystalline condition its formula is $2C_{20}H_{24}N_2O_2 \cdot H_2SO_4 + 7H_2O$;

when dried at 115°C . it loses 14.45 per cent. of water; in practice the loss varies between 14.38 and 14.8. A good sample will usually not lose more than 13.8 to 14.4 per cent. by drying, but no sample should lose more than 14.6 per cent. without exciting suspicion.

If left for some time in a dry and moderately warm situation, the crystallized sulphate loses nearly $5\text{H}_2\text{O}$ ($= 10.32$ per cent.), leaving $2\text{C}_{20}\text{H}_{24}\text{N}_2\text{O}_3 \cdot \text{H}_2\text{SO}_4 + 2\text{H}_2\text{O}$, which contains 4.60 per cent. of water. In this form, the salt is less presentable in appearance, but is permanent at temperatures below 100°C . The sulphate would be well suited for pharmaceutical purposes in this condition, since it is not liable to loss or absorption of moisture, and contains a maximum amount of 5 per cent. of water; it would also be impossible to moisten it without altering its appearance. Another means of avoiding the inconvenience arising from the variation in composition which is noticed in the ordinary commercial sulphate, would be to replace it by the hydrochloride, which is a far less variable salt, and is also more easily assimilated. As long as the crystallized sulphate is used, it is necessary to estimate the percentage of water in every sample in determining its value.

The percentage of water is estimated either by finding the quantity of anhydrous alkaloid, and then calculating from the formula the quantity of water as recommended by Dwars (*Archiv der Pharm.*, xi., 149), or better, by directly estimating the loss of water, when from one to two grams are dried by heating very gradually to 115°C .

The Testing of Quinine Sulphate. Dr. O. Hesse. (*Ber. der deutsch. chem. Ges.*, xiii., 1517-1520.) The author raises various objections to the ammonia process recommended by Kerner and adopted in the German Pharmacopœia (see the preceding abstract). He points out that cinchonidine, when freshly precipitated, is even more soluble in ammonia solution than quinine itself, and that this fact renders the test unavailable for the detection of cinchonidine if present in small proportion. He further shows that when cinchonidine sulphate, instead of being merely mixed with quinine sulphate, is crystallized along with the latter, it assumes a form in which it escapes detection by this test to a not inconsiderable extent.

According to the author's experience, the percentage of water contained in commercial quinine sulphate often affords a ready indication of the presence or absence of cinchonidine. Pure sulphate of quinine, which has not effloresced, contains eight molecules, or 16.17 per cent., of water; while cinchonidine sulphate crystallizes with six molecules, or 13.7 per cent. The purer the sample, if dry

and without signs of efflorescence, the nearer is the percentage of water of crystallization to 16.17; and a decidedly lower percentage of water in such samples may therefore be regarded as due to the presence of sulphate of cinchonidine.

The author also describes an optical method for the detection of sulphate of cinchonidine in the quinine salt.

The Thalleioquin Test. C. F. Zeller. (*Chem. News*, xlii., 107.) The results of the author's experiments recorded in this paper are summarized in the following conclusions:—

1. That the chlorine water for performing this test should be freshly prepared is not absolutely necessary, *provided* it is preserved in amber-coloured glass bottles, tightly corked, and kept in a dark place. Chlorine water which had been kept in this manner over a year gave the coloration distinctly.

2. That hydrochloric acid, when added to *fresh* chlorine water, in quantities not exceeding 25 per cent., does not prevent its giving the test colour, but will require a proportionately large amount of ammonia to neutralise the acid so added.

3. That when hydrochloric acid is present in *old* chlorine water (the result of decomposition), it is due to the loss of chlorine so incurred that the solution loses its value as a test liquid.

4. That bromine water is a very much more delicate test than chlorine water, requiring but one-fifth as much, or even less, to produce the same results.

5. On account of the simplicity and ease with which bromine water can be made, it is very much to be preferred as a means of performing the thalleioquin test.

Constitution of some of the Cinchona Alkaloids. Dr. O. Hesse. (*Liebig's Annalen*, ccv., 314–359.) The author has investigated the action of acetic anhydride and of hydrochloric acid on some of the cinchona bases, and arrives at the conclusion that quinine and cinchonidine contain one hydroxyl-group capable of being exchanged for acetyl.

Oxidation of the Cinchona Alkaloids with Potassium Permanganate. S. Hoogewerff and W. A. v. Dorp. (*Liebig's Annalen*, cciv., 84.) Quinine, cinchonine, quinidine, and cinchonidine, when oxidized by permanganate, yield tricarboxypyridinic acid together with ammonia, oxalic and carbonic acids, and some other products which need further examination. A dicarboxylic acid identical with Weidel's cinchomeronic acid is easily obtained from the tricarboxylic acid. A monocarboxylic acid has also been prepared but not fully investigated.

The action of permanganate on the four cinchona alkaloids seems to be as follows:—In the first stage, the molecules containing two nitrogen atoms are split into two groups containing one atom of nitrogen in each. In the second stage, the nitrogen of one of these groups is evolved as ammonia, while from the other several bodies containing nitrogen are obtained, among the rest tricarboxypyridinic acid.

The authors do not agree with Weidel and Herzig's supposition that cinchomeronic acid is constituted (according to Körner's pyridine and quinoline formula) as 1, 2, 3, the nitrogen having the place 1; but they assign this constitution to their quinolic acid, obtained by the action of permanganate on quinoline, and which they consider to be the normal oxidation product of this body.

Cinchonidine and Homocinchonidine. Dr. O. Hesse. (*Liebig's Annalen*, ccv., 194–211. From *Journ. Chem. Soc.*)

The author has established that the mother-liquor of cinchonidine sulphate is separated by fractional crystallization into two portions, of which one agrees with Winkler's quinidine sulphate, but the second portion is distinctly different. The author has also compared Koch's cinchonidine and quinidine (*Pharm. Post*, x., 208), and has found that the former agrees with the second fraction alone, whilst Koch's quinidine agrees with the author's cinchonidine sulphate. In order to distinguish this alkaloid, it has been named homocinchonidine. Further researches have shown that homocinchonidine sulphate, when mixed with quinine sulphate, does not crystallize in the form of homocinchonidine, but in the form of cinchonidine sulphate.

Part I. Cinchonidine.—The author has modified his process of preparing cinchonidine. A dilute aqueous solution of its sulphate is precipitated by ammonia, the precipitate is then dissolved in hot alcohol, and this latter on evaporation gives crystals of cinchonidine and homocinchonidine, whilst the quinine remains dissolved. The cinchonidine and homocinchonidine may be separated by fractional crystallization from the aqueous solutions of their sulphates. Cinchonidine is pure when (1) its solution in excess of dilute sulphuric acid gives no fluorescence; (2) it melts at 200° C.; (3) its neutral sulphate crystallizes out from a solution in hot water (1 : 50) in the form of glistening needles.

The author assigned the formula $C_{20}H_{24}N_2O$ to cinchonidine; he now changes it to $C_{19}H_{23}N_2O$, although his combustion analyses agree better with the former than with the latter formula.

Cinchonidine dissolves in ether (sp. gr. 72) in the ratio 1 : 188,

in alcohol (97 per cent.) in the ratio 1 : 16.3. In the optical rotatory power ($p = 4$, $t = 15$), in chloroform solution $[\alpha]_D = -70.0$, for solution in dilute hydrochloric acid ($p = 5$) $[\alpha]_D = -174.6$. Cinchonidine hydrochloride forms dark octahedral crystals containing 1 molecule H_2O . From analyses of the hydrochloride, platino-chloride, neutral sulphate, and from the fact that cinchonidine when treated with hydrochloric acid is converted into apocinchonidine, $C_{19}H_{22}N_2O$, without formation of methyl chloride, the formula $C_{19}H_{22}N_2O$ is established for cinchonidine.

By varying the conditions neutral cinchonidine sulphate crystallizes out from its aqueous solution with 6, 5, or 2 molecules H_2O .

Cinchonidine quinate is formed by the direct action of cinchonidine and quinic acid; it crystallizes in glistening needles.

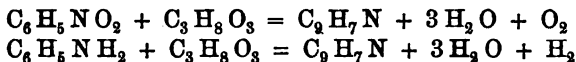
Cinchonidine salicylate crystallizes in colourless needles with composition $C_{19}H_{22}N_2O \cdot C_7H_6O_3$.

Part II. *Homocinchonidine* (cinchonidine of Skraup and Vortmann, Koch, Kerner).—This alkaloid accompanies cinchonidine in many cinchona barks; it passes into the dark sulphate mother-liquors in the quinine manufacture. Homocinchonidine crystallizes from alcohol in dark anhydrous prisms, but from a dilute solution in leaflets; it dissolves in chloroform, but is almost insoluble in water. Its alcoholic solution is strongly alkaline. For its optical rotatory power the author finds in alcohol solution ($p = 2$) $[\alpha]_D = -107.3$, for chloroform solution ($p = 4$) $[\alpha]_D = -70.0$, for hydrochloric acid solution $[\alpha]_D = -167.9$. Homocinchonidine melts at 205° ; its solution in excess of dilute sulphuric acid gives no fluorescence, and its alcoholic solution with chlorine and ammonia gives no coloration. Its formula is $C_{19}H_{22}N_2O$. Neutral hydrochloride of homocinchonidine crystallizes in rhombic octahedra, containing 1 molecule H_2O , or from a concentrated solution with 2 molecules H_2O . The platino-chloride forms an orange-yellow crystalline powder. The hydriodide, sulphocyanide, and nitrate crystallize in colourless prisms, the tartrate and thiosulphate in colourless needles. The neutral sulphate crystallizes from hot water in white needles with 6 molecules H_2O . From strong concentrated aqueous solutions of the sulphate, the salt separates out in a thick mass, which after drying resembles magnesia, and it is this form which occurs in commerce.

Neutral homocinchonidine phenyl sulphate crystallizes in glistening needles, the acid sulphate in colourless prisms, and the quinate in white needles. The author's researches have established that it

is not possible to convert cinchonidine and homocinchonidine one into the other, and that these alkaloids are different in their properties.

A New Synthesis of Chinolin. Z. H. Skraup. (*Ber. der deutsch. chem. Ges.*, xiii., 2086.) Chinolin may be formed by heating nitrobenzol or aniline—or better still, a mixture of the two—with glycerin and sulphuric acid. The reactions are explained by the following equations:—



Action of Phosphorus Pentachloride and Oxychloride on Cinchonine Hydrochloride. W. Koenigs. (*Ber. der deutsch. chem. Ges.*, xiii., 285–287. From *Journ. Chem. Soc.*) The mode of union of the oxygen in cinchonine and quinine is still unknown. According to Wright, the acetyl and benzoyl derivatives described by Schützenberger are really derived from the isomeric bases cinchonidine and quinine. Zorn (*J. pr. Chem.*, viii., 279), by the action of fuming hydrochloric acid at 140–150°, obtained the chlorinated bases, $\text{C}_{20}\text{H}_{23}\text{N}_2\text{Cl} + \text{H}_2\text{O}$ and $\text{C}_{20}\text{H}_{23}\text{N}_2\text{OCl} + \text{H}_2\text{O}$, from cinchonine and quinine respectively. These retain chlorine and water with great obstinacy, and cannot be reconverted into the alkaloids. Zorn regards them as formed by displacement of hydroxyl by chlorine, whilst Hesse (*Annalen*, clxxiv., 340) looks on them as addition compounds. By a similar process, Skraup (*Ber.*, xii., 1107), obtained from cinchonine a brominated base, $\text{C}_{19}\text{H}_{23}\text{N}_2\text{OBr} + \text{H}_2\text{O}$, which parts with its bromine when heated with silver oxide, forming a very soluble and unstable base. Since cinchonine yields formic acid by oxidation with permanganate, Skraup supposes that it contains the group OCH_3 , and that the nascent methyl bromide formed from this combines with the nitrogen to form the bromide of an ammonium base. Finally, Wischnegradsky (*Ber.*, xii., 1480) regards cinchonine as a ketone, its reduction products, $(\text{C}_{19}\text{H}_{23}\text{N}_2\text{O})_2\text{H}_2$ and $\text{C}_{19}\text{H}_{24}\text{N}_2\text{O}$, being related to it as pinacone and isopropyl alcohol are to acetone.

Neither phosphoric chloride nor oxychloride acts on cinchonine; but when 6–7 parts of oxychloride are gradually added to 1 part of cinchonine hydrochloride (dried at 110°), mixed with 2 parts of phosphoric chloride, the mass becomes warm, and hydrochloric acid is evolved: the reaction having been completed by prolonged heating at 80–100°, the cooled product is poured into ice-cold water. On adding ammonia to this solution, a resinous precipitate

first falls, and on continuing the addition a white crystalline mass slowly separates. When crystallized from dilute alcohol, this forms broad needles (m. p. 52°), soluble in alcohol, ether, benzene, chloroform, and carbon bisulphide, sparingly so in boiling water. The results of analysis agree best with the formula $C_{11}H_{21}N_3Cl$. The body is probably, therefore, cinchonine in which hydroxyl has been replaced by chlorine. Its hydrochloric acid solution gives a crystalline precipitate with platinic chloride. Hot alcoholic potash or sodium amalgam at ordinary temperatures remove chlorine from it, by which reaction it is distinguished from Zorn's chlorocinchonide, $C_{20}H_{25}N_3OCl$, which is not so affected.

The Nitroprussides of the Alkaloids. Dr. E. W. Davy. (*Pharm. Journ.*, 3rd series, xi., 756.) The author has ascertained that nitroprussic acid, the composition of which is represented by the formula $H_2(NO)FeCy_6$, is capable of forming compounds with the different vegetable alkaloids, which are, for the most part, very sparingly soluble in water; and such compounds may be readily obtained by treating soluble salts of the alkaloids with a solution of sodium nitroprusside, when the base will be precipitated in union with the nitroprussic acid, producing sometimes a very characteristic deposit.

On being so formed, the salt will in some cases, as in those of strychnine and brucine, exhibit itself from the first as a more or less crystalline precipitate; but in many instances, if the precipitated nitroprusside is examined under the microscope, it will be found to be at first amorphous, or in the form of minute oil-like globules, which latter, on subsiding, or on agitation, adhere to the sides and bottom of the vessel containing the mixture, forming a sticky, resinous-looking deposit; or the particles agglutinate together into little lumps or masses of a similar character. But these deposits, on standing for a variable period, assume, for the most part, a more or less crystalline condition. In some cases, however, as, for example, in those of veratrine and cinchonidine, there appeared to be no disposition on the part of the salts to acquire a crystalline form, even after the lapse of a considerable time. Some of the alkaloids, as those of morphine and nicotine, from their forming much more soluble salts with nitroprussic acid, their nitroprussides cannot be obtained by precipitation, as in the case of those alkaloids the nitroprussides of which are sparingly soluble salts. But these can be easily made either by directly dissolving the alkaloid in nitroprussic acid, or by treating solutions of the chlorides with silver nitroprusside, or their sulphates with a

solution of barium nitroprusside; when, in the first case, the insoluble silver chloride, and in the second barium sulphate is formed, either of which can be easily separated by filtration from the soluble alkaloid nitroprusside produced, which on subsequent evaporation, if the salt is crystallizable, can be obtained in a crystalline form. But the use of the silver salt with the chloride of the alkaloid is to be preferred, as affording greater facilities for the preparation of the nitroprusside of the alkaloid in a pure condition.

Nitroprussic acid forms two classes of salts with the alkaloids, viz., neutral and acid salts. In the first there exist two molecules of the base and one of the acid, and in the second one molecule of each. Some of the alkaloids, as for example, morphine, strychnine, and brucine, seem to be capable of forming only neutral salts, whereas others, as those of quinine, cinchonine, and nicotine, form both neutral and acid salts in combining with nitroprussic acid. In some cases the neutral salt is the most readily crystallizable, and the acid one much less so, and *vice versâ*. Thus the quinine neutral salt crystallizes with great facility, whereas the acid one does so with difficulty; on the other hand, the nicotine acid salt readily assumes the crystalline form, whereas the neutral one appears to be non-crystallizable.

The author describes in detail the preparation and properties of the nitroprussides of the more important alkaloids, commencing with strychnine, it being one of the few organic nitroprussides to which some very slight attention on the part of chemists had already been given. From his observation that some of those salts are very sparingly soluble in water (the nitroprusside of brucine requiring about 736, that of strychnine 847, and that of quinine 2,500 times their weight of water at the ordinary temperature in their solution, whilst that others, as those of morphine and of nicotine, are very soluble salts), and also from the difference in their degree of solubility, together with the characteristic appearances, which some of those compounds present when examined under the microscope, he expresses a hope that his researches on the nitroprussides of the alkaloids may prove to be of some practical value, as adding to the distinctive characters of those bases, and thus furnishing additional means for their detection and separation under different circumstances.

Picrotoxin. MM. Barth and Kretschy. (*Ber. der deutsch. chem. Ges.*, xiii., 1243.) Owing to differences in the formulæ given by different chemists for picrotoxin, the poisonous principle of

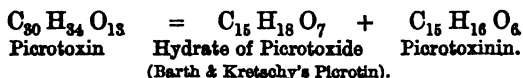
cocculus indicus (*Menispermum cocculus*), the authors have reinvestigated this substance. By a process of fractional crystallizations from benzol, and from water, they have ascertained that this substance is a mixture of three different bodies, which they propose to name "picrotoxin," "picrotin," and "anamirtin," in the relative proportions of 32 : 66 : 2.

Picrotoxin fuses at 201° C., and reduces silver nitrate (especially on addition of ammonia) and Fehling's solution when heated. It is exceedingly bitter and poisonous. The numbers obtained in its analysis lead to the formula $C_{15}H_{16}O_6 + H_2O$.

Picrotin, $C_{25}H_{30}O_{13}$, with a variable amount of water of crystallization, is obtained from benzol in four-sided needles with oblique ends. It fuses at 250° C., reduces silver nitrate and Fehling's solution, and is bitter, but not poisonous.

Anamirtin is found in the mother-liquors of the pure picrotoxin when crystallized from water. It has a neutral reaction, does not reduce ammoniacal silver solution, nor Fehling's copper solution, has almost no bitter taste, and is not poisonous. The analyses correspond nearly to the formula $C_{19}H_{24}O_{10}$.

Picrotoxin. E. Paternò and A. Ogliastro. (*Gazz. Chim. Ital.*, x., 36-52, and *Ber. der deutsch. chem. Ges.*, 1881, 539-540.) Barth and Kretschy claim to have shown that commercial picrotoxin is a mixture of three different bodies, named by them picrotoxin, picrotin, and anamirtin (see the preceding abstract). The correctness of this statement is called in question by the authors, who arrive at the conclusion that the "picrotoxin" and "picrotin" of Barth and Kretschy are decomposition products of true picrotoxin formed during the repeated boiling with benzol. They regard picrotin identical with their hydrate of picrotoxin, $C_{15}H_{18}O_7$ (*Year-Book of Pharmacy*, 1880, p. 42), and the "picrotoxin" of the two chemists named as a new compound which the authors propose to name picrotoxinin, in order to distinguish it from the true picrotoxin naturally contained in *Cocculus indicus*. They also reassert the correctness of $C_{30}H_{34}O_{13}$ as the formula of true picrotoxin, and explain the decomposition of this body into picrotoxinin and hydrate of picrotoxin by the following equation:—



As to the anamirtin of Barth and Kretschy, the authors state that the picrotoxin they worked with did not contain that substance, as

it had been purified by repeated crystallizations by the manufacturer before it reached them.

Picrotoxin and other Constituents of *Cocculus Indicus*. Drs. E. Schmidt and E. Löwenhardt. (*Ber. der deutsch. chem. Ges.*, 1881, 817.) The authors confirm the recent statement by E. Paternò and A. Ogliastro (preceding abstract) as to the non-existence of picrotin and picrotoxinin (Barth and Kretschy's picrotoxin) in commercial picrotoxin, and also concur in the opinion that these two substances are decomposition products formed from picrotoxin during the boiling with benzol.

They also announce the isolation from *cocculus indicus* of a new body, which they provisionally name "*cocculin*." It crystallizes in fine white needles, devoid of bitterness, almost insoluble in water, alcohol, and ether, and corresponding to the formula $C_{19}H_{36}O_{10}$. Possibly this body may prove to be identical with Barth and Kretschy's anamirtin (see this volume, p. 48).

Santonin Derivatives. S. Cannizzaro and J. Carnelutti (*Ber. der deutsch. chem. Ges.*, xiii., 1516.) By the fusion of santonic and isosantononic acids with barium hydrate, the authors obtained a body having the formula $C_{19}H_{13}O$. Since this body when distilled with zinc-dust yields a hydrocarbon, $C_{12}H_{13}$, whose physical properties, and the properties of its picric acid compound, and of its tribromoderivative, show it to be dimethylnaphthalene, the authors conclude that the compound, $C_{12}H_{13}O$, is dimethylnaphthol. The dimethylnaphthalene contains the methyl groups in the same relative position that the bromine atoms occupy in Glaser's dibromonaphthalene (m. p. 80·5–81°). Santonic acid distilled over zinc-dust yields some dimethylnaphthol, also dimethylnaphthalene and propylene. A small quantity of xylene appears to be formed.

Metasantonin. Two Isomerides of Santonin. S. Cannizzaro and J. Carnelutti. (*Gazz. Chim. Ital.*, x., 461–465. From *Journ. Chem. Soc.*) When santonic acid is heated with hydriodic acid and amorphous phosphorus, it has been shown that, besides other substances, two crystalline isomerides of santonin are formed, melting at 160·5° and 136° respectively. These may be obtained more conveniently by boiling parasantonide with hydriodic acid and phosphorus. The solution is then concentrated to remove part of the hydriodic acid, diluted with water, saturated with sodium carbonate, and agitated with ether. On evaporation a mixture of the two metasantonins is left; these can only be separated by mechanical selection of the crystals, as their behaviour with

solvents is almost identical. A mixture of the metasantonins may also be obtained by dissolving parasantonide or parasantonie acid in 10 parts of concentrated sulphuric acid, heating to 100° for two hours, diluting, neutralizing with sodium carbonate, and agitating with ether.

The one metasantonin (m. p. 136°) crystallizes in large monoclinic prisms which are easily powdered; the other (m. p. 160.5°) forms thin flexible plates belonging to the trimetric system. The rotatory power of both is the same.

By adding the requisite quantity of bromine to the metasantonins dissolved in chloroform, and heating until hydrobromic acid ceases to be given off, they are converted into *monobromometasantonins*, $C_{15}H_{17}BrO_3$; the one from the metasantonin of m. p. 136° forms small white crystals (m. p. 114°), very soluble in ether and in chloroform. The other, from the metasantonin of m. p. 160° , crystallizes in long silky needles (m. p. 212°), very soluble in chloroform, but only sparingly in ether. The corresponding *di-bromometasantonins*, melting at 186° and 184° respectively, are produced by the continued action of bromine on the monobromoderivatives. The first crystallizes in small feathery groups of needles moderately soluble in chloroform, sparingly in ether; the second also forms colourless needles, moderately soluble in both ether and chloroform. Crystalline compounds are produced by the action of chlorine on the metasantonins, but they have not as yet been studied.

Ptomaines considered in Relation to Forensic Chemistry and Toxicology. T. Husemann. (*Archiv der Pharm.* [3], xvi., 169–181. From *Journ. Chem. Soc.*) The name “ptomaines” has been given by Selmi to bodies which have been detected in exhumed corpses, and resemble the vegetable alkaloids in their chemical reactions and physiological effects. The author gives a summary of the observations already published on this class of bodies, and considers the very important bearing they have on the study of poisons and on forensic medicine. It becomes extremely important to discover, if possible, reactions which will distinguish between these poisonous bodies, which are the result of putrefactive processes, and those very similar vegetable principles which, when administered, may produce death. Bodies of the “ptomaine” class seem to have different physiological actions. Some appear to act as poisons, others are inactive; whilst others again counteract the effects of poisonous substances.

The study of these bodies embraces also the poisonous effects

produced by food in certain conditions of putrefaction or fermentation. Panum showed that albuminous substances by putrefaction yielded a poisonous body, acting like a ferment, soluble in water, insoluble in alcohol, and capable of withstanding a temperature of 100°. This has been confirmed by Bergmann, who describes a compound called sepsin, generated by putrefaction.

It appears from the researches of Panum and of Schweninger, that compounds having different physiological actions are produced at different stages of decay.

Sonnenschein and Zuelzer found in an anatomical maceration fluid an alkaloid which resembled atropine in its action, and poisonous sausages produced a similar effect; the existence of a product of decay which caused tetanic symptoms was also noticed. Aebi and Schwabenbach detected a compound allied to an ethereal salt in extractions from dead bodies. Substances derived from putrefaction of maize certainly produce tetanic symptoms, as was first proved by Lombroso and Erba; and this action has been traced to the presence of basic substances. It appears probable, however, that drowsiness, loss of sensation, and weakening of the action of the heart may be due to the presence of acid bodies in the extract of putrefied maize, since lactic acid and sodium lactate produce effects similar to those of morphine. Lombroso thinks that the tetanic and narcotic action of extract of putrefied maize, and its beneficial effect on several skin affections, indicate the possible origin of pellagra in diseased or putrid maize. This would explain the prevalence of pellagra in the South European maize-growing countries, and in other countries it may originate from the putrefaction of albuminoid substances of other cereals. This kind of putrefaction cannot be caused by artificial heat, although it occurs only in hot summer weather, and probably therefore requires the presence of special microscopic organisms. A similar explanation may be applied to tetanic symptoms caused by wounds and prevented by the Lister treatment. Frequently the tetanising principle in the maize extract has its action masked by a narcotic substance; just as Ranke showed that the physiological action of strychnine in bodies long buried may be masked by ptomaines.

Lombroso's suggestion that skin complaints may be due to putrefactive products of maize has its known analogues in erysipelas caused by wound poisoning, and in skin eruptions caused by eating bad fish and other putrefying substances. Such poisonous effects are, however, often produced by parts of living organisms, as for instance by the beard of the mussel; and they are not produced

on all individuals, since dogs accustomed to eat decomposing substances are not affected by putrefactive principles.

The relation of these products of putrefaction to certain diseases is evident from the fact that Sonnenschein's alkaloid is found in the bodies of patients dying from typhus fever, and many individuals poisoned by decomposing food show marked typhus symptoms.

In many cases of poisoning by cheese, it was found that the bad effect was not due to vegetable growths or to microscopic organisms, and the cheese was frequently fresh.

It appears from the study of the literature concerning ptomaines, that they are usually produced in bodies which, after brief exposure, have been excluded from air, as in buried bodies, sausages, and tinned foods; and further, in these cases, the production chiefly occurs in the internal portions. Cases, however, are known where similar principles have been present in comparatively fresh substances which have been constantly exposed to the air; hence under the name "ptomaines" must be included all alkaloidal products of decay, whether formed in the presence or absence of air.

Test for Distinguishing Ptomaines from Vegetable Alkaloids. P. Brouardel and E. Boutmy. (*Comptes Rendus*, xcii., 1056.) The authors state that, with the exception of morphine and veratrine, vegetable alkaloids have no reducing action on potassium ferricyanide, while ptomaines reduce this reagent. In order to test a base extracted from a corpse in cases of suspected poisoning, they convert it into sulphate, and mix a few drops of the solution with a small quantity of weak solution of the ferricyanide. If then on the addition of a drop of ferric chloride a dark blue precipitate is formed, the base in question was probably a ptomaine; if no such precipitation occurs, the base may be regarded as a vegetable alkaloid.

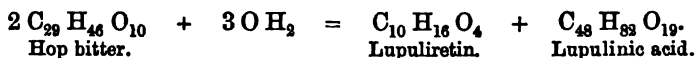
The Ferricyanide Test for Ptomaines. A. Gautier. (*Repert. de Pharm.*, ix., 278.) Referring to the application of potassium ferricyanide as a test for distinguishing ptomaines from vegetable alkaloids, as recommended by Brouardel and Boutmy (see preceding abstract), the author reports that this test cannot be depended upon, as some slight reduction of the ferricyanide is brought about not only by morphine and veratrine, but also by hyoscyamine, emetine, igasurine, colchicine, nicotine, and apomorphine. The reaction is also shared by a number of artificial bases, some of which are very poisonous.

The Ferricyanide Test for Ptomaines. C. Tanret. (*Repert. de Pharm.*, x., 281.) In a paper on the alkaloids from peptones, the

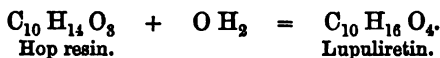
author refers to Brouardel and Bontmy's test for distinguishing ptomaines from vegetable alkaloids (see the two preceding abstracts). He finds that ergotinine, aconitine, digitalia, eserine, and hyoscyamine all effect some reduction in the ferricyanide, so as to cause a precipitate of Prussian blue on the addition of ferric chloride.

The Bitter Principle and Resin of Hops. Dr. Max Issleib. (*Pharm. Journ.*, 3rd series, ix., 6-10.) In an elaborate research on this subject, the details of which will be found in the source referred to, the author arrives at the following conclusions:—

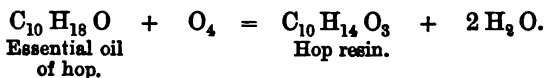
There exists in hops and in lupulin a peculiar bitter substance of the formula $C_{29}H_{46}O_{10}$, which is decomposed by acids in accordance with the following equation:—



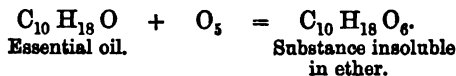
The lupuliretin obtained by the decomposition of the hop bitter is related to the resin and the essential oil. From hop resin it differs by H_2O .



It may be that hop resin is derived from the essential oil, as follows:—



The substance insoluble in ether is a simple oxidation product of the hop oil; thus:—



The hop resin stands, however, in certain relation to the substance insoluble in ether, so that the assumption is permissible that in the oxidation of the essential oil of hop, first resin is formed, and afterwards, by further oxidation, the substance insoluble in ether, which is richer in hydrogen and oxygen.

Saliretone. P. Giacosa. (*Journ. für pract. Chem.*, xxi., 221. From *Journ. Chem. Soc.*) A new crystalline substance was obtained by heating saligenol and mannitol at 100° ; it did not appear to be a compound of saligeninol with mannitol, but rather a new condensation product of saligeninol itself. To this body the author assigns the name

saliretone. It was obtained in still larger quantities on substituting for the mannitol its equivalent weight in glycerol, and it was likewise obtained by heating saligeninol with methylol with a reversed condenser on the water-bath. The most efficient method for preparing this new body is to heat equal weights of saligenin and dry glycerol in *sealed tubes* (on heating in open vessels no saliretone, or but mere traces, are obtained) for eight hours in boiling water; the saligeninol melts, and the whole mass is converted to a yellowish homogeneous fluid. On adding water, a yellowish resinous mass separates, partly soluble in water on boiling, from which the saliretone crystallizes out on cooling in rhombic plates and needles.

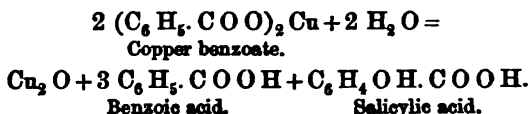
The product weighs only 2.5 per cent. of the weight of the saligenol employed, the greater portion remaining unchanged. The saliretone can be further purified by re-crystallization from hot water, or still more readily by solution in very dilute cold potash solution, and precipitation by hydrochloric acid. Purified saliretone, $C_{14}H_{12}O_3$, melts at 121.5° .

Saliretone gives no blue with ferric chloride; its dry crystals, however, like salicin and its derivatives, give a fine red colour with concentrated sulphuric acid. The fixed alkalis dissolve it easily, but it is reprecipitated in needles on addition of acids. Difficultly soluble in ammonia, and precipitated on dilution. After being melted, saliretone no longer crystallizes; heated above 140° , it suddenly evolves gas, a distinct smell of salicylic aldehyde is observed, and a resinous body is left. Resinous bodies were also obtained by prolonged boiling with water, or by the action of chlorine or bromine.

Saliretone was heated at $135\text{--}140^\circ$, until the weight was constant, the product extracted by ether evaporated, and the residue dissolved in dilute potash. The resinous precipitate thrown down by hydrochloric acid, washed, and dried at 140° , gave numbers agreeing, though not absolutely, with Piria's saliretin, C_7H_6O (*Ann. Chim. Phys.* [2], lxi., p. 318; and [3], xiv., p. 268).

Synthesis of Salicylic Acid. E. F. Smith. (*Am. Chem. Journ.*, ii., 338.) One part of copper benzoate was heated with about 3 parts of distilled water in a sealed tube, at a temperature of 180°C. , for three hours, when a large quantity of cuprous oxide separated. After pouring out the contents of the tube, acidulating and removing the copper by hydrogen sulphide, the solution was distilled, whereby some undecomposed benzoic acid distilled over with the steam. The residual liquid, evaporated down, yielded needle-shaped crystals, fusing at 156°C. , and giving with ferric

chloride the characteristic coloration of salicylic acid. Several of its salts were also formed and identified. The reaction is as follows:—



Synthesis of Citric Acid. E. Grimaux and P. Adam. (*Comptes Rendus*, xc., 1252–1255, and *Journ. Chem. Soc.*, 1880, 801.) The artificial formation of citric acid was realized in the following manner:—Symmetrical dichloracetone was prepared by oxidation of the symmetrical dichlorhydrin of glycerol. It was purified by combination with sodium hydrogen sulphite, and then heated in a water-bath with concentrated hydrocyanic acid. The cyanodichloracetone, which is a crystalline body, was not isolated, but treated directly with hydrochloric acid; the product, when the reaction was complete, was distilled in a vacuum, and the residue taken up by ether. On evaporation a thick syrup remained, which after a few days solidified to a mass of crystals of dichloracetic acid,—



These crystals were in the form of transparent laminae, fusible at 90–92°; very soluble in alcohol, water, and ether; not volatile without decomposition, except at a very gentle heat, when partial sublimation takes place.

The dichloracetic acid was saturated with sodium carbonate, and heated with two molecules of potassium cyanide in concentrated solution; the sodium dicyanoacetate was not separated but saturated with hydrochloric acid gas, and heated in a water-bath for fifteen hours. After volatilizing the hydrochloric acid, the citric acid was extracted from the residue by careful neutralization and precipitation with milk of lime. The insoluble salt was decomposed by sulphuric acid, and the solution, after concentration in a vacuum, was left to spontaneous evaporation.

The identity of the artificial product with the natural acid was proved by analysis and by crystallographic comparison under the microscope. Its melting point was 146–147°.

Artificial Production of Citric Acid. Prof. Kekulé. (From *Ber. der deutsch. chem. Ges.*) The starting point selected by the author was malic acid, a product which can be obtained synthetically. From this acid it is easy to obtain di-ethyl malate, and this, when treated with acetyl chloride, yields acetyl-malic-ether, as previously

shown by Wislicenus. Upon treating a solution of the last-named compound in ordinary ether with metallic sodium and monobromoacetic acid, decanting from the precipitated sodium bromide, and saponifying the clear liquid with alcoholic solution of potash, a potash salt insoluble in ether is obtained. In order to liberate the acid from this, it is only necessary to convert the potash salt into the lead salt, and to decompose the latter by means of sulphuretted hydrogen. The acid thus produced by the author was found to be identical with citric acid in its reactions.

Decomposition of Citric Acid by Distillation. R. Anschütz. (*Ber. der deutsch. chem. Ges.*, xiii., 1541.) The product passing over between 200–215° C. separates into two layers, the heavier one of which yields, on fractional distillation under reduced pressure, citraconic and itaconic anhydrides.

A New Reaction of Tartaric Acid. H. J. H. Fenton. (*Chem. News*, xliii., 110.) The reaction is brought about by adding to a solution of tartaric acid or alkaline tartrate a small quantity of ferrous sulphate or chloride, followed by one or two drops of hydrogen peroxide, and finally an excess of potash or soda. A beautiful violet colour is thus obtained, which in very strong solutions appears almost black. At first sight it seems probable that this colour was due to the formation of an alkaline ferrate. This explanation was not, however, supported by further experiments. The solution may be evaporated to dryness in a vacuum without losing its properties, which are evidently due to some products of the decomposition, or perhaps direct oxidation of tartaric acid. This reaction may also be produced by electrolysis a solution of tartaric acid, using an iron plate for the positive electrode. The liquid around this plate turns yellow, and if now a solution of potash be added, the violet colour at once appears. As a test for the identification of tartaric acid, this reaction is said to be one of easy application and of average delicacy. It is necessary, however, to avoid the presence of heavy metals and of oxidizing agents before applying it. The author is working with this violet substance with a view of isolating it.

Cause of the Reddening of Carbolic Acid. E. Fabini. (*Pharmaceut. Zeitung*, 1880, 766.) The author has observed that commercial carbolic acid, when left in contact with copper for a few days, assumes a distinct red colour, and that this coloration is produced in a few hours if the acid, containing a trace of copper, is exposed to the action of ammonia gas. He therefore concludes that the gradual spontaneous reddening of the commercial acid is due to

the combined action of traces of copper contained in it and the ammonia present in the atmosphere.

Cause of the Reddening of Carbolic Acid. H. W. Langbeck. (*Pharmaceut. Zeitung*, 1881, 260.) Dr. Hager attributes the reddening of carbolic acid to the action of ammonium nitrite contained in the atmosphere (*Year-Book of Pharmacy*, 1880, p. 90), while E. Fabini regards it as due to the action of atmospheric ammonia on traces of copper contained in the acid (see the preceding abstract).

The author of this paper agrees with neither of these views, and confirms Hoffmann's assertion that many samples of the reddened acid are absolutely free from copper. From his experiments the reddening appears to be due to the formation of rosolic acid under the influence of light.

The Reaction of Ferric Chloride with Salicylic, Carbolic, Gallic, and Tannic Acids. Dr. H. Hager. (*Amer. Journ. of Pharm.*, 1880, 264.) The substances which interfere with the violet coloration which ferric chloride gives with these acids are numerous, and by noticing them we may obtain a clue as to which of the acids may be present in a solution. Thus with salicylic acid the action is not disturbed or hindered by the presence of acetic, boracic, sulphuric, nitric, or hydrochloric acid (all acids in dilute condition), common salt, nitre, glycerin, alcohol, amyl alcohol, or ether. It is hindered by caustic alkalies, alkaline carbonates, sodium acetate, ammonium acetate, borax, potassium iodide, sodium phosphate, oxalic, citric, tartaric, phosphoric, and arsenic acids. With carbolic acid the reaction is not hindered by boracic acid, common salt, or potassium nitrate. It is hindered by acetic, oxalic, tartaric, citric, sulphuric, hydrochloric, nitric, and phosphoric acids, sodium acetate, ammonium acetate, borax, sodium phosphate, glycerin, alcohol, amyl alcohol, and ether.

Phosphoric acid decolorizes both with salicylic and carbolic acids, and with gallotannic and gallic acids as well. The officinal sodium phosphate, however, hinders the reaction with salicylic and carbolic acids, but not with tannic and gallic acids.

For a preliminary distinction between salicylic and carbolic acids the solution is to be treated in abundance with alcohol or glycerin, or with dilute acetic acid, and then tested with ferric chloride. Salicylic acid will give the reaction, carbolic will not.

To distinguish whether gallotannic or gallic acid be present, add sodium phosphate to the solution, and then test with ferric chloride. The violet coloration will show their presence, but it is not produced by salicylic or carbolic acid.

Meconic Acid. D. B. Dott. (*Pharm. Journ.*, 3rd series, xi., 576.) The author's previous researches on the meconates of morphine (*Year-Book of Pharmacy* 1880, p. 19), have shown that meconic acid cannot be regarded as tribasic. The prevailing belief in the tribasic nature of this acid is due to the supposed composition of its silver and lead salts. In Watts's "Dictionary," and in other works, triargentic and triplumbic meconates are described. The triargentic salt is said to be produced by adding nitrate of silver to a neutral solution of ammonium meconate; or by boiling the bibasic salt with water. Wackenroder appears to have been the first to furnish this information. Similarly, by adding acetate of lead to neutral solution of ammonium meconate, the triplumbic salt is said to be thrown down.

The author has prepared and analysed these salts with results which do not bear out the conclusions generally accepted. The silver salts obtained by precipitation from neutral and acid solutions were of very variable composition, no two precipitates containing the same proportion of silver, and none attaining the percentage required by the triargentic salt. The silver was estimated by igniting the salts, after drying at 110–120° C. The percentages obtained varied from 35.03 to 55.81. A quantity of argentic meconate was boiled in water for a few hours, then dried and found to contain 56.45 per cent. of silver. Another precipitate boiled for twenty-four hours gave a yield of silver equal to 63.73 per cent. A portion of the same boiled with water for forty hours gave 88.87 per cent. silver. The quantity of silver calculated from the formula $\text{Ag}_3\text{C}_7\text{H O}_7$ would, however, be 62.18 per cent.

These results show that the precipitates experimented with have not the composition of definite salts, but must be regarded as mixtures, and that meconate of silver, when boiled with water, gradually suffers decomposition until almost nothing but oxide of silver is left. By stopping the process at the proper time it is possible to obtain a combination containing silver in the proportion required by a tribasic meconate, but it would be fallacious to conclude that such a substance is anything but a mixture.

The lead salts prepared by precipitation gave a proportion of oxide varying from 56.21 to 64.77 per cent. The formula $\text{Pb}_3(\text{C}_7\text{H O}_7)_2$, however, corresponds to 65.91 per cent.

Stenhouse states that he obtained basic meconates of lead, one of them yielding as much as 74.7 per cent. of Pb O . In the author's opinion it is just this tendency of meconic acid to form basic salts that has given rise to the belief that the acid is tribasic. So far as

present knowledge goes, the evidence is in favour of the dibasic nature of the acid.

Researches on Levulic Acid. This acid forms the subject of four separate papers, viz. :—

Formation of Levulic Acid from Dextrose. A. V. Grote and B. Tollens. (*Liebigs Annalen*, ccvi., 226–231.)

Formation of Levulic Acid from Milk-sugar. H. Rodewald and B. Tollens. (*Ibid.*, ccvi., 231, 232.)

Conversion of Levulic Acid into Normal Valeric Acid. E. A. Kehrer and B. Tollens. (*Ibid.*, ccvi., 233–248.)

Oxidation of Levulic Acid. B. Tollens. (*Ibid.*, ccvi., 257–273.)

For details reference must be made to the sources quoted.

Purification of Chrysophanic Acid. J. Agema. (*Pharmaceut. Zeitung*, 1881, 91.) The commercial acid may be readily purified by dissolving it in chloroform and mixing the solution with an equal volume of spirit of wine. The acid is thus precipitated while the impurities remain in solution. A repetition of this process yields the acid in a perfectly pure condition.

A New Reaction of Gallic Acid. W. L. Dudley. (*Zeitschrift für analyt. Chem.*, 1880, 484.) A solution of ammonium picrate (made by mixing a weak aqueous solution of picric acid with an excess of ammonia), when added to an aqueous solution of gallic acid, produces a red coloration which rapidly passes to a fine green.

With tannic and pyrogallic acids a similar reddish coloration is obtained, which does not, however, change to green.

Simple Process of preparing Pyrogallic Acid for Photographic Purposes. Prof. T. E. Thorpe. (From a paper read before the Photographic Society.) The usual mode of obtaining pyrogallic acid, viz., by heating gallic acid, is very un-economical, because the decomposition, instead of proceeding wholly in accordance with the equation



is almost unavoidably accompanied by the formation of metagallic acid, $\text{C}_6\text{H}_4\text{O}_2$.

The difficulties attending the conversion of gallic acid into pyrogallol have their natural effect upon the price of the latter article. Photographers will be interested, therefore, in learning that they may be able profitably to prepare their own pyrogallol from gallic acid by the following simple and expeditious process :—

Ten grams (say 150 grains) of dry gallic acid and 30 c.c. (say 1 fluid ounce) of glycerine (preferably Price's) are placed in a two-ounce flask or wide test-tube, and heated on a sand-tray to a temperature of from 190–200°, so long as bubbles of carbon dioxide are seen to be formed in the liquid. The gallic acid readily dissolves, and in a very short time it is entirely converted into the theoretical quantity of pyrogallol; this fact has been verified by direct observations made in the author's laboratory. The brown viscous liquid, after cooling, is diluted with 1000 c.c. (say 34 ounces) of water. A solution is thus obtained, each $\frac{1}{2}$ ounce of which contains rather more than $1\frac{1}{2}$ grain of pyrogallol, sufficient, therefore, for developing a quarter-plate according to Mr. Swan's instructions. In containing glycerine, it of course resembles Mr. B. J. Edwards's solution, which has found favour with many photographers.

The method of conversion is very easy; the only point to be attended to is the temperature, which should not be allowed to exceed 200°, otherwise the glycerine becomes very brown in colour. The thermometer should be supported in the flask or tube by a cork, perforated, of course, to allow of the escape of the carbon dioxide; and the bulb should be surrounded by the liquid, which should be shaken from time to time. The solution may, however, be very dark coloured without sensibly staining the film, provided, of course, that the time of development be not unduly prolonged.

Tannic Acid. (*Pharm. and Chem.*, 1880, 459.) A new and beautiful form of tannin is now being produced in Germany (Berlin). It is made by allowing a syrupy ethereal solution of tannic acid to drop from a perforated vessel through a warm atmosphere, for a distance of about sixteen feet, on to a rapidly revolving cylinder, from which it is removed in the shape of fine threads, presenting a pseudo-crystalline appearance.

Quercro-tannic Acid. J. Loewe. (*Zeitschr. für analyt. Chem.*, 1881, 208.) The author finds that this acid is not a glucoside. It occurs in oak bark in two forms, differing from each other in the degree of their solubility in water. The more soluble one corresponds to the formula $C_{28}H_{28}O_{14} \cdot H_2O$, and the difficultly soluble one to $C_{28}H_{24}O_{13}$. When boiled with dilute acids both yield oak-red, $C_{28}H_{22}O_{11}$.

Catechin. C. Liebermann and Tauchert. (*Ber. der deutsch. chem. Ges.*, xiii., 694.) Catechin, when prepared from catechin by Loewe's process (*Zeitschr. für analyt. Chem.*, 1874, 113), and purified by repeated recrystallization from hot water, is obtained in small needle-shaped crystals answering to the formula $C_{21}H_{20}O_9$ +

5 H₂O. The authors have also prepared and examined several derivatives of this substance, viz., diacetic catechin, C₂₁H₁₈Ac₂O₉, dichloroacetic catechin, C₂₁H₁₆Cl₂Ac₂O₉, and monobromoacetic catechin, C₂₁H₁₇BrAc₂O₉. The results obtained in the examination of these products confirm the formula C₂₁H₂₀O₉ as the correct one for catechin.

Estimation of Tannic Acid. E. Lehmann. (*Pharmaceut. Zeitung*, 1881, 322.) The author finds the gelatine process, if properly applied, to be more satisfactory than any other method. He prepares the test solution by dissolving 10 grams of gelatine in 1 litre of cold saturated solution of ammonium chloride, and standardizes this on pure tannin. Of the substance in which the tannin is to be estimated he exhausts a weighed quantity, corresponding to about .2 to .6 gram of tannin, three or four times with boiling water, and makes up the cooled and united decoctions to 200 c.c. To 20 c.c. of the filtered liquid he adds an equal volume of cold saturated solution of ammonium chloride, and then the gelatine solution, drop by drop, from a burette, stirring well during the addition, as long as a precipitate continues to be formed. As soon as the reaction appears to be completed, he passes a small quantity of the mixture through a small filter on two watch glasses, and tests one portion of the filtrate with a drop of the gelatine solution, and the other with a drop of solution of tannin. The slightest precipitation can be observed by placing the watch glasses upon a black ground. If the end of the reaction has been exceeded, or not yet been reached, the titration is repeated with another 20 c.c. of the filtered decoction until the exact point of complete precipitation has been accurately ascertained.

Crystallized Anhydrous Oxalic Acid. A. Villiers. (*Comptes Rendus*, xc., 821.) By dissolving one part of ordinary oxalic acid in twelve parts of warm concentrated sulphuric acid, and allowing the solution to stand for several days, the anhydrous acid, H₂C₂O₄, is deposited in the form of transparent crystals, which on exposure to air absorb two molecules of water and fall to powder.

Glyoxylic Acid. C. Böttinger. (*Liebig's Annalen*, xcxcviii., 203.) The results of the author's experiments are summarized in the following conclusions:—

1. The transformation of glyoxylic acid into glycollic and oxalic acids depends on the decomposition of a salt of definite composition.
2. With hydrocyanic acid and sulphuretted hydrogen, it behaves similarly to its homologue, pyruvic acid.

3. Ammonia converts glyoxylic acid into amidoglyoxylic acid; aniline into aniloglyoxylic acid.

4. Glyoxylic acid behaves like an aldehyde.

5. Glyoxylic acid is sharply distinguished from pyruvic acid by its slighter tendency to condensation, which is explained by the absence of a hydrocarbon radicle (methyl).

Apophyllenic Acid. (*Ber. der deutsch. chem. Ges.*, xiii., 1635; and *Amer. Journ. of Pharm.*, 1880, 548.) In the decomposition of narcotine by oxidation with manganese dioxide and sulphuric acid, Wöhler obtained, besides opianic acid and cotarnine, an oxidation product of this latter substance, an acid containing nitrogen, which, because of the resemblance of its crystals to the mineral apophyllite, he named apophyllenic acid. The condition of its formation and its composition were not determined however. It is difficultly soluble in cold, more readily soluble in hot, water, insoluble in alcohol and ether. It fuses, with partial decomposition, at 241–242° C. An analysis gave figures corresponding to $C_8H_7NO_4$. When strongly heated it decomposes, giving a pyridinic odour. Heated with strong hydrochloric acid, in sealed tubes, to 240–250° C., for two or three hours, it is decomposed, yielding the methyl group to the hydrochloric acid, and there remains a crystallizable acid, $C_7H_5NO_4$. A study of the salt of this acid shows it to be identical with the dicarbopyridinic acid of Hoogewerff and Van Doop, or the cinchomeronic acid of Weidel. The apophyllenic acid is simply the acid methyl ether of this dibasic acid. A pyridine derivative is therefore found among the decomposition products of an opium alkaloid, which makes it probable that the opium bases, equally with the alkaloids of the chinchona bark, are to be considered as pyridine or chinolin derivatives.

A Crystallizable Acid from Mistletoe. M. Pavlevsky. (*Bull. de la Soc. chim.* [2], xxxiv., 348.) The leaves of the mistletoe, *Viscum Album*, contain a crystallizable acid corresponding to the formula CH_4O_4 , or $(CH_3O_3)HO$. It forms large prisms insoluble in alcohol and ether, slightly soluble in water, and fusing at 101–103° C. It is obtained by boiling the leaves with water acidulated with nitric acid, and allowing the decoction to cool. The silver salt of this acid is explosive.

Vulpic and Pulvic Acids. A. Spiegel. (*Ber. der deutsch. chem. Ges.*, xiii., 1629.) Vulpic acid, which has recently been investigated by Möller and Strecker (*Liebig's Annalen*, cxiii., 56), is obtained from *Cetraria vulpina*, in which it exists to the extent of 1.5 to 4 per cent. It fuses at 140° C.

When heated to 200°C ., vulpic acid splits up into methyl alcohol and pulvic anhydride, $\text{C}_{18}\text{H}_{10}\text{O}_4$, the solution of which in hot soda solution and acetone yields, upon the addition of hydrochloric acid, a precipitate of pulvic acid, $\text{C}_{18}\text{H}_{12}\text{O}_6$. The last-named acid may also be obtained by heating vulpic acid with milk of lime, and acidulating the solution. It fuses at $214\text{--}215^{\circ}\text{C}$., and is readily soluble in alcohol, but less soluble in water, chloroform, and ether. Pulvic anhydride crystallizes from benzol in pale yellow needles, which fuse at $120\text{--}121^{\circ}\text{C}$., and are readily soluble in hot chloroform, benzol, glacial acetic acid, and acetone; slightly soluble in alcohol, and insoluble in water and solutions of alkaline carbonates. The author gives a description of the barium, calcium, and silver salts of this acid, and of several derivatives of both pulvic and vulpic acids.

The Alleged Formation of Adipic Acid from Camphor. J. Kachler. (*Ber. der deutsch. chem. Ges.*, xiii., 487.) The author contradicts Ballo's statement (*Ber.*, xii., 1597) that adipic acid is formed by the oxidation of camphor with chromic acid. The oxidation products of this reaction contain camphoronic and hydro-oxycamphoronic acids, but no adipic acid.

The Formation of Adipic Acid from Camphor. M. Ballo. (*Ber. der deutsch. chem. Ges.*, xiv., 332.) Replying to Kachler (see the preceding abstract), the author asserts that adipic acid, obtained by him among the oxidation products of camphor, is identical with hydro-oxycamphoronic acid.

Arbutin. H. Schiff. (*Gazz. Chim. Ital.*, xi.; and *Pharmaceut. Zeitung*, 1881, 163.) The results of the author's investigation confirm Fittig's observation that the glucoside from *Arctostaphylos Uva Ursi* and *Pyrola umbellata*, described by Hlasiwetz and Habermann, and said to answer to the formula $\text{C}_{25}\text{H}_{34}\text{O}_{11}$, is not pure arbutin, but a mixture of arbutin, $\text{C}_{12}\text{H}_{16}\text{O}_7$, and methylarbutin, $\text{C}_{13}\text{H}_{18}\text{O}_7$.

Pure arbutin crystallizes in long silky needles fusing at $165\text{--}166^{\circ}\text{C}$. Whether this substance is always associated with methylarbutin in the plants named, or whether the latter body accompanies the former only under particular conditions, is still an open question.

A Crystallizable Glucoside from Ivy Leaves. L. Vernet. (*Comptes Rendus*, xcii., 360.) The author has isolated from the leaves of the ivy, *Hedera Helix*, a glucoside crystallizing in colourless silky needles, which is soluble in alkalies, boiling alcohol, hot acetone, benzol, and ether, but insoluble in water, chloroform, and petroleum. Its composition is represented by the formula $\text{C}_{32}\text{H}_{54}\text{O}_{11}$. It fuses at 233°C ., and is decomposed at higher temperatures. In order to prepare it, the leaves are first exhausted with water and then with

alcohol, the alcoholic liquors evaporated to dryness, the residue extracted with benzol, the insoluble matters boiled with acetone, and the latter allowed to cool.

Waldivin. C. Tanret. (*Bull. de la Soc. chim.* [2], xxxv., 104.) Waldivin is the name of a neutral bitter crystallizable principle, of the formula $C_{18}H_{24}O_{10}$, $2\frac{1}{2}H_2O$, which the author has isolated from the powdered fruit of *Simaba waldivia*, by exhausting with alcohol of 70 per cent., removing the latter from the tincture by distillation, shaking the residue while still warm with chloroform, evaporating the chloroform solution, and extracting the residue with boiling water. On cooling, the principle is obtained in the form of hexagonal prisms, which are slightly soluble in cold water and absolute alcohol, rather more soluble in boiling water and in diluted alcohol, and very soluble in chloroform. Its aqueous solutions froth abundantly, and are excessively bitter. It is easily decomposed by alkalis, losing its bitterness with caustic alkalis nearly instantaneously.

Composition of Æsculin and Æsculetin. C. Liebermann and R. Knietzsch. (*Ber. der deutsch. chem. Ges.*, xiii., 1590.) The authors confirm Rochleder's empirical formulæ for æsculetin, $C_9H_6O_4$, and for æsculin, $C_{15}H_{16}O_9$, and give an account of some bromo-derivatives of both.

Caryophyllin. E. Hjelt. (*Ber. der deutsch. chem. Ges.*, xiii., 800.) This body is a polymeride of camphor, to which Mylius has assigned the formula $C_{30}H_{32}O_9$. The author has examined an acetyl-derivative and two choral-derivatives of this substance, and arrives at the conclusion that its proper formula is $C_{40}H_{64}O_4$. By oxidation with nitric acid it is converted into caryophyllic acid, $C_{40}H_{64}O_{12}$.

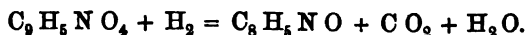
Curcumin. C. L. Jackson. (*Ber. der deutsch. chem. Ges.*, xiv., 485.) To prepare this substance Bengal turmeric is freed from oil by means of carbon bisulphide, then extracted with ether, the ethereal solution allowed to evaporate, and the residue purified by washing with cold, and re-crystallizing with hot alcohol. It forms yellow prisms fusing at $178^\circ C.$, and corresponding to the formula $C_{28}H_{26}O_8$, which does not agree with any of the formulæ previously published by Kachler, Gajewsky, and Daube.

Hæmatein. W. Halberstadt and M. A. v. Reis. (*Ber. der deutsch. chem. Ges.*, xiv., 611.) Pure hæmatein, obtained from aged logwood by extraction with ether, forms red crystals of a metallic lustre, sparingly soluble in water and alcohol, insoluble in benzol, and having a composition represented by the formula $C_{16}H_{16}O_6$. It can be heated up to $200^\circ C.$ without suffering decomposition.

Hæmatein, and Commercial Extract of Logwood. M. Reinhard.

(*Chemical Review*, 1881, 226.) Commercial hæmatein, according to the author, contains in round numbers 54 per cent. of hæmatoxylin, 20 of hæmatein, 6 of insoluble residue, and 10 of water. A sample of French extract examined by him was found to have almost exactly the same composition; while a sample of American extract proved to contain 51 per cent. of hæmatoxylin, 10 of hæmatein, 17 of insoluble matter, and 20 of water. From these figures he concludes that the hæmatein of commerce is a pure, well-dried extract of logwood, prepared from carefully fermented materials. The more carefully the logwood chips are fermented before extraction, the more hæmatein is formed.

Synthesis of Indigo. Prof. A. Baeyer. (*Annales de Chim. et de Phys.*, 1880, 286; and *Amer. Journ. Pharm.*, 1880, 611.) Although it was announced some years ago that the artificial formation of indigo had been effected, yet the process was so expensive and the yield obtained so trifling that no importance attached to the announcement. The author, who made the previous synthesis, has, however, succeeded now in effecting the synthesis in a more direct way, and with a yield almost, if not quite, corresponding to the amount calculated from the material taken. He has, therefore, patented two processes, the general outlines of which are now made public. The starting-point of both of them is cinnamic acid (contained in storax and in Peru and tolu balsams), or rather its derivative, nitro-cinnamic acid, and of this the ortho variety only. This ortho-nitro-cinnamic acid, $C_6H_4(NO_2).C_3H_3O_2$, according to the first procedure, is treated with bromine, yielding $C_6H_4(NO_2).C_3H_3Br_2O_2$; this treated with boiling alcoholic potash solution loses $2HBr$, and yields $C_6H_4(NO_2).C_3HO_2$. This compound, orthonitrophenylpropionic acid by name, when treated with an alkali and reducing agent simultaneously, yields indigo blue according to the following reaction:—



The author recommends the use of a mixture of glucose and an alkaline carbonate. The reaction takes place very readily at $110^\circ C.$, indigotine separating out in the crystalline form. According to the second process the nitro-cinnamic acid is treated with hypochlorous acid, yielding $C_6H_4(NO_2).C_3H_4ClO_3$, with elimination of H_2O and HCl . This compound, treated with boiling caustic alkalies, yields $C_6H_4(NO_2).C_3H_3O_3$. The simple application of heat ($110^\circ C.$) decomposes this compound orthonitrophenyloxyacrylic acid, yielding indigotine, C_8H_5NO . He prefers, however, the

first process, as giving the largest yield and as, moreover, offering the advantage of having the indigo blue produced right in the fibre. Thus, if a textile fibre be impregnated with a mixture of the nitrophenylpropionic acid and the glucose and alkaline salt, and then exposed to a current of superheated steam at 110°C ., the indigo is produced at once in the fibre. Further details as to relative cost of production and yield possible will be awaited with great interest.

Ethyl Bromide. L. Wolff. (*Amer. Journ. of Pharm.*, 1880, 241.) The author's experiments lead him to regard the following as the best method for the preparation of this new anæsthetic :—

Twenty-four ounces of potassium bromide, coarsely powdered, are added to a mixture of 64 ounces of sulphuric acid and 32 ounces of water. After the mixture has sufficiently cooled, 16 fluid ounces of alcohol (95 per cent.) are added thereto, the whole placed in a large flask contained in a sand-bath, the flask connected with a Liebig's condenser, and this with a receiver containing about an ounce of water. Heat is then applied to raise the contents of the flask to about 200°F ., and this temperature maintained until the reaction ceases. The product thus obtained will amount to about twenty ounces; it should be shaken with solution of potassium bicarbonate, subsequently washed with water, and then purified by redistillation from a water-bath the temperature of which is not allowed to exceed 125°F .

Prepared in this manner, ethyl bromide is free from all disagreeable odour, perfectly colourless and limpid, and of 1.40 sp. gr. It boils at 106°F .

The results of the author's physiological experiments on animals seem to warrant the conclusion that ethyl bromide is as safe an anæsthetic as ether, and certainly much more so than chloroform.

Detection of Methyl Alcohol in Ethyl Alcohol. P. Cazeneuve, and M. Cotton. (*Journ. de Pharm.* [5], ii., 361; *Journ. Chem. Soc.*, April, 1881.) Ethyl alcohol is only slowly oxidized by potassium permanganate, whereas methyl alcohol is instantly attacked. On this property the authors have based a method for the detection and estimation of methyl alcohol in ethyl alcohol by noticing the time required for the formation of a brown colour when a given volume of potassium permanganate solution (1 in 1,000) is added to a given volume of alcohol, and also the depth of colour, which varies from a yellow to mahogany brown, according to the quantity of permanganate added.

The following table gives the coloration produced by perman-

ganate solution (1 in 1,000) added to ethyl alcohol, containing different proportions of methyl alcohol; temperature 20° C. :—

| Alcohol. | Time. | 1 c.c. Reagent. | 5 c.c. Reagent. | 10 c.c. Reagent. |
|--|--------------------------|--------------------------------------|-----------------------|---------------------|
| Ethyl Alcohol... .. | Instant of adding | Rose colour | Rose colour | |
| | After 5 minutes | Yellowish rose | | |
| | " 10 " | Yellow rose | | |
| | " 15 " | Yellow, with rose shade | Mahogany brown | |
| | " 20 " | Yellow | | |
| Ethyl Alcohol and 10 per cent. Methyl Alcohol (methylated spirits) | Instantly | Yellow | Yellow of burnt sugar | Mahogany brown |
| Ethyl Alcohol and 8 per cent. Methyl Alcohol | Instantly | Yellow | Yellow of burnt sugar | Mahogany brown |
| Ethyl Alcohol and 5 per cent. Methyl Alcohol | 4 seconds | Yellow | Mahogany brown | Mahogany brown |
| Ethyl Alcohol and 3 per cent. Methyl Alcohol | 15 " | Yellow | Mahogany pink | |
| Ethyl Alcohol and 1 per cent. Methyl Alcohol | { Instantly 5 minutes | Pink, with shade of yellow Yellow | | |

Should the alcohol contain other organic substances which are readily acted upon by potassium permanganate, it should be diluted with water to separate the resins, and distilled to free it from sugar, etc.

Presence of Alcohols in Plants. M. Gutzeit. (*Bied. Centr.*, 1880, 377.) The author has recognised the presence of ethyl and methyl alcohols in the distillates from the fruits of *Heracleum giganteum*, *Pastinaca sativa*, and *Anthriscus Cerefolium*, and has satisfied himself that these alcohols are not formed during the distillation, but pre-exist in the plants.

Preparation of Pure Acetic Ether. J. A. Pabst. (*Bull. de la Soc. chim.* [2], xxxiii., 350.) A cooled mixture of 50 c.c. sulphuric acid and 50 c.c. alcohol is placed in a retort and heated at 140°, a mixture of equivalent parts of alcohol and acetic acid being allowed to run in slowly; at first a little ether distils over, but after a short time ethyl acetate is given off. The reaction commences at 130–135°C, whilst at 145° sulphurous anhydride is evolved.

The distillate is washed with a saturated solution of calcium chloride, then dried over calcium chloride, and redistilled. Pure

ethyl acetate is insoluble in a solution of calcium chloride, but if it contains 30 per cent. alcohol, calcium chloride solution dissolves appreciable quantities. A mixture of 1 volume ethyl acetate, and 1 volume alcohol, forms a homogeneous mixture with 2 volumes of a solution of calcium chloride. By the above method 90 per cent. of the theoretical yield of ethyl acetate may be obtained. The reaction which takes place is similar to that in the formation of ether by the action of sulphuric acid on alcohol.

The Preparation of Formic Ether. H. Trimble. (*Amer. Journ. of Pharm.*, March, 1881.) The author finds the usual process to be a long and tedious one, and recommends in its place one based on the well-known formation of formic acid from oxalic acid and glycerine:—

Ten parts each of oxalic acid and glycerin with 1 part of water are heated in a flask connected with a condenser for about twelve hours, at a temperature between 100° and 110° C. When effervescence has ceased, a small quantity of liquid will be found in the receiver, but as that is largely water it may be rejected. To the mixture in the flask, consisting of glycerin and formic acid, is added 4 parts of alcohol, and the whole kept at a temperature not exceeding 50° C. for several hours. It is then submitted to distillation, continued until the thermometer indicates 120° C. The distillate is found to consist of two layers. The upper ethereal one is separated, washed with water containing a little sodium hydrate, and distilled.

The yield is about 4 parts. Sp. gr. at 15.5° C., .910.

Direct Production of Chloroform and Bromoform. M. Damoiseau. (*Amer. Journ. Sci.*, March, 1881.) The author has studied the action of porous bodies in causing the reaction of chlorine upon methyl chloride. A regular current of chlorine gas mixed suitably with methyl chloride is passed through a long tube filled with animal charcoal and heated to 250–350°. By washing with water hydrochloric acid gas is removed, and the condensed product corresponds to the mixture employed. Chloroform is produced with great ease and uniformity in this way. Bromine acts similarly, producing from CH_3Br , CH_2Br_2 , CHBr_3 and CBr_4 . Acetic acid treated with 2, 4, 6 atoms of bromine in this way, gives carbon dioxide and brominated derivatives of formene. Chlorine and acetic acid give chloroform in considerable quantity.

The Testing of Essential Oil of Mustard. Prof. Flückiger. (*Pharmaceut. Post*, 1880, No. 17; *Amer. Journ. of Pharm.*, Nov., 1880; *Pharm. Journ.*, 3rd series, xi., 472; *Journ. Chem., Soc.*, 1881,

125.) Mustard oil is frequently adulterated with carbon bisulphide, and therefore it is of great consequence to be able to readily detect its presence. This may be done by distilling the oil at a low temperature, when the carbon bisulphide passes over, and may be converted into ammonium thiocyanate by treatment with alcoholic ammonia. A better way of treating the distillate, if the quantity obtained will allow of its being adopted, is to take its boiling point and specific gravity, since in presence of ammonia mustard oil decomposes to a small extent, traces of ammonium thiocyanate being formed.

The principal compound formed by the action of ammonia on mustard oil, namely, thiosinamine, $C_4H_8N_2S$, may be used to determine the value of the mustard oil. A weighed quantity of the oil is treated with alcoholic ammonia until the smell of mustard oil has entirely disappeared. The solution is then evaporated to dryness and weighed. A moderate heat must be used in order to reduce the quantity of ammonium thiocyanate formed to a minimum.

Mustard oil when exposed to the direct rays of the sun darkens in colour, and a brown deposit forms. The oil then gives a red colour with ferric chloride, and the compound thus formed is insoluble in ether, it is therefore not due to the presence of thiocyanic acid.

When the formation of xanthic acid is used as a test for the presence of carbon bisulphide in mustard oil, care must be taken that all traces of the oil are removed, as its presence may lead to deceptive conclusions, unless very dilute alcoholic potash is used in the reaction.

Pure mustard oil exposed to diffused sunlight undergoes no change. If, however, it contains carbon bisulphide, the colour changes to a very dark brown, and a dirty brown-red deposit is formed.

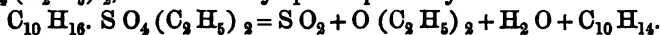
Caffeol, or Oil of Coffee. M. Bernheimer. (*Wien. Acad. Ber.*, ii., 1032.) Caffeol is one of the products given off during the roasting of coffee, and is obtained to the extent of 0.05 per cent. of the latter. Its formula is $C_8H_{10}O_2$. It boils at $196^\circ C$., and possesses the aroma of coffee in a very marked degree. In the author's opinion, it is a methyl ether of saligenin, as by oxidation with potassium bichromate and sulphuric acid it yields salicylic acid. He regards it as a decomposition product formed from the coffeotannic acid.

Some Constituents of the Essential Oils of *Origanum Vulgare* and *Thymus Serpyllum*. E. Jahns. (*Archiv der Pharmacie* [3], xvi., 277; and *Pharm. Journ.*, 3rd series, xi., 157.) The oil of

Origanum vulgare examined by the author was a pale yellow thin fluid, of sp. gr. 0.871 at 150° C. It was laevogyre, the α , in a column 100 mm. long being $= -84.4^\circ$. Potash solution removed from the oil only a very small quantity of phenols (estimated at scarcely one per cent.), one of which gave with alcoholic ferric chloride a violet, and the other a green colour. The separation of these phenols was effected in the manner described in the former paper. They did not appear to differ from those occurring in other *origanum* oils, but the quantity was not sufficient for further experiments.

An opinion has been expressed that the liquid phenol which Buri found in the essential oil of *Thymus Serpyllum* might be identical with carvacrol, because in many reactions it appeared to resemble it, whilst the near natural relationship of the genera *Origanum* and *Thymus* would favour such an opinion. That this opinion is at least partially correct has been shown by the author's repetition of Buri's experiments, from which it appears that the phenol of this oil consists of thymol, carvacrol, and a third phenol-like body giving a violet coloration with ferric chloride. Owing to scarcity of material, this last body was not further examined.

Conversion of Terebenthene into Cymene. M. Bruère. (*Comptes Rendus*, xc., 1428-1429. From *Journ. Chem. Soc.*) When terebenthene is dropped slowly into boiling sulphuric acid mixed with 2 mols. of water, a mixture of cymene with unaltered terebenthene and water distils over. This unaltered terebenthene is polymerised by agitation with concentrated sulphuric acid, and the cymene purified by a final distillation. The water is separated out from the product, the sulphurous acid neutralized with sodium carbonate, and the remaining liquid dried and fractionally distilled. Unsuccessful attempts were made to substitute other bodies for sulphuric acid, which is very violent in its action, but on heating 1 mol. of terebenthene with 1 mol. of ethyl sulphate at 120° for 10-15 hours, the mixture assumes a violet colour, and contains cymene, ether, and sulphurous acid. By allowing terebenthene and ethyl sulphate to remain in contact for some time at 100°, the mixture gradually becomes homogeneous. The liquid produced is heavier than water, is stable at the ordinary temperature, of a lemon-yellow colour, and peculiar odour. When cooled to -20° the mixture separates into two layers, one of terebenthene, the other of ethyl sulphate. The homogeneous solution appears to be a very unstable combination of terebenthene and ethyl sulphate, $C_{10}H_{16} \cdot SO_4(C_2H_5)_2$, which readily splits up into cymene and ether:—



Action of Sodium on Turpentine Hydrochloride. E. A. Letts. (*Ber. der deutsch. chem. Ges.*, xiii., 793-796. From *Journ. Chem. Soc.*) When turpentine hydrochloride is fused with sodium, and the product distilled after removal of the chlorine, a fine white solid (m. p. 157°) is obtained as the chief product; but on raising the temperature, a yellowish white liquid (b. p. 326-330°) passes over, which solidifies in feathery crystals resembling sal ammoniac.

The first of these bodies melts at 94°, and is supposed by the author to have the composition $C_{10}H_{17}$, and not that of a mixture of $C_{10}H_{16}$ and $C_{10}H_{18}$. The second body also melts at 94°, and consists of $C_{30}H_{34}$. It is extraordinarily stable. The mother-liquor remaining after the crystallization of this body has the same boiling point and composition as the crystals, so that there seem to be two modifications of a new hydrocarbon, $C_{30}H_{34}$.

The so-called liquid turpentine hydrochloride, when acted on by sodium, yields a solid which is identical with the second solid body obtained above.

Montgolfier, who has repeated the author's experiments (*Comptes Rendus*, lxxxvii., 840-842), finds that the first described solid, with lower boiling point, is a mixture of inactive camphene, $C_{10}H_{16}$, and camphene hydride, $C_{10}H_{18}$, and has isolated the two bodies from the mixture. He gives the melting point of camphene hydride as 120°. He has also obtained the liquid hydrocarbon with higher boiling point, and names it colophene hydride, $C_{20}H_{34}$.

By the action of sodium on liquid turpentine hydrochloride, he has obtained two liquids, $C_{10}H_{18}$, boiling at 165-166°, and $C_{10}H_{16}$, boiling at 173°. He has also isolated small quantities of the solid $C_{10}H_{18}$ from the product of the last reaction.

Preparation of Camphoric Acid and Camphoric Anhydride. P. Maissen. (*Gazz. Chim. Ital.*, x., 280-281. From *Journ. Chem. Soc.*) Instead of acting directly on camphor with nitric acid, the mixture of camphor and borneol obtained as a residue in preparing borneol by Baubigny's method may be employed. Camphor is dissolved in any convenient hydrocarbon boiling above 100°, and sodium is introduced into the hot solution in small pieces at a time until it no longer dissolves. When cold, the pasty mass is agitated with water, and the oily layer separated and distilled. The residue in the retort may be used for the preparation of camphoric acid. For this purpose, 300 grams are boiled with 800 of nitric acid and 200 of water for three days. The crude acid which separates in the crystalline state may be purified by dissolving it in potash, filtering, and precipitating with an acid. The yield is about 80 per

cent., whilst camphor never gives more than 50 per cent. of its weight.

To prepare camphoric anhydride, the camphoric acid is boiled with acetic anhydride and dry sodium acetate in molecular proportions. When cold, the product is extracted with cold water, and the residue crystallized from boiling alcohol. In this way almost the whole of the camphoric acid is obtained as pure anhydride (m. p. 217°C.)

Camphor Chlorides. F. V. Spitzer. (*Ber. der deutsch. chem. Ges.*, xiii., 1046.) The author finds that when phosphorus pentachloride is allowed to act upon camphor at an ordinary temperature, the only product of the reaction is camphor dichloride, $\text{C}_{10}\text{H}_{16}\text{Cl}_2$. He entirely failed to obtain the monochloride, $\text{C}_{10}\text{H}_{15}\text{Cl}$, described by Pfaundler. If the reaction be allowed to proceed at an elevated temperature, a product is obtained containing less chlorine than the dichloride; but the author regards such products as mixtures, the chief constituent of which is in every instance the dichloride.

Compound of Camphor and Chloral Hydrate. P. Cazeneuve and M. Imbert. (*Bull. de la Soc. chim.* [2], xxxiv., 209.) The authors have investigated the well-known liquid compound obtained by triturating camphor with crystallized chloral hydrate. From the results of their experiments they conclude that this liquid is an unstable molecular compound similar to the combinations of camphor with alcohol, acetic acid, and nitric acid.

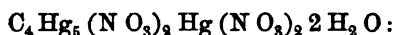
Reduction Products of Camphor. H. Schröter. (*Ber. der deutsch. chem. Ges.*, xiii., 1621.) When camphor is heated with zinc dust, the products of distillation contain benzol, cymene, toluene, and paraxylene, the same bodies which Fittig and others obtained by heating camphor with fused zinc chloride.

Essential Oil of Onodaphne Californicum. J. M. Stillman. (*Ber. der deutsch. chem. Ges.*, xiii., 629.) The leaves of *Onodaphne Californicum*, the Californian bay tree, yield upon distillation with steam, three per cent. of a pale yellow oil of an agreeable aromatic odour, and separable by fractional distillation into turpinol, $(\text{C}_{10}\text{H}_{17})_2\text{O}$, and umbellol, $\text{C}_8\text{H}_{13}\text{O}$.

Essential Oil of Hemp. L. Valente. (*Journ. Chem. Soc.*, 1881, 284.) The essential oil from *Cannabis indica* has already been examined by Bohlig and by Personne, the latter of whom obtained from it a liquid and a solid hydrocarbon. The author has prepared the essential oil from ordinary hemp (*C. Sativa*), by distilling the fresh leaves with water, and agitating the milky distillate with ether. The oil, dried over calcium chloride and distilled repeatedly

from sodium, is colourless and mobile (b. p. 256–258°). Its sp. gr. at 0° referred to water is 0.9292. The analyses agreed with the formula $C_{15}H_{24}$; the vapour-density, however, could not be determined by the ordinary methods, as the oil decomposes at 300°. It mixes in all proportions with alcohol, ether, and chloroform. Bromine acts energetically on it, forming a crystalline compound, which has not yet been investigated. Nothing at all resembling the solid hydrocarbon mentioned by Personne could be observed.

The Action of Alcohol on Mercuric Nitrate. R. Cowper. (*Journ. Chem. Soc.*, 1881, 242–247; *Pharm. Journ.*, 3rd series, xi., 807.) With the intention of preparing some fulminate of mercury, the author had dissolved some mercury in nitric acid, and from accidental circumstances had left the solution standing some days before adding alcohol. On the addition of this substance and heating, a precipitate formed which was not fulminate of mercury. The investigation of this body is given in the present paper. Its formation was first observed by Soluro and Selmi, and afterwards investigated by Gerhardt, who describes it as a nitrate of ethyl, the hydrogen of which is entirely replaced by mercury, crystallized with a molecule of mercuric nitrate and two molecules of water,



this substance was not recrystallized, and was probably impure. Mercury is dissolved in twelve times its weight of nitric acid (1.3), the solution is allowed to stand until all nitrous fumes have escaped and the liquid is colourless; twelve parts by weight of pure alcohol, sp. gr. 0.80, are added, and the mixture heated. As soon as a precipitate forms, the source of heat is withdrawn. The crystalline precipitate is washed with alcohol and then with water. It was recrystallized from dilute nitric acid (1 vol. in 4), and gave on analysis the formula $(C_2 H_2 Hg_3 O_2)'' (N O_3)_2$. It detonates when mixed with sand, and struck. If its temperature be raised rapidly it explodes at 129–130°. If the temperature be raised very slowly it decomposes quietly, leaving oxide and nitrate of mercury. This substance can be prepared without heat. Treated with fuming nitric acid and alcohol it yields fulminate. It may be regarded as the nitrate of a dyad radical consisting of acetylene combined with mercury and mercuric oxide. By treatment with potash a hydrate was obtained $(C_2 H_2 Hg_3 O_2) (H O)_2$. By treatment with potassic oxalate an oxalate was obtained from the nitrate, with the formula $(C_2 H_2 Hg_3 O_2) C_2 O_4$. Sulphuretted hydrogen decomposes the nitrate, forming mercaptan and mercury sulphide. In a note

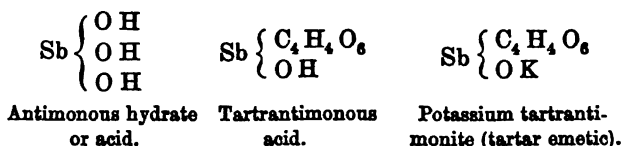
appended to the paper, Dr. Debus looks upon this new base as belonging to the type glycol, $C_2H_4(HO)_2$, and gives $(C_2H_3Hg_3O_2)(HO)_2$ as the formula of the new base.

Preparation of Pure Silver Nitrate. P. Solthier. (*Ber. der deutsch. chem. Ges.*, Jan. 10th, 1880.) Commercial silver is dissolved in nitric acid, the solution mixed with just sufficient hydrochloric acid to ensure complete precipitation, the precipitated chloride allowed to settle, the clear liquid decanted from the precipitate, and the latter dissolved in solution of ammonia without previous washing. The ammoniacal solution is filtered into a tall cylinder furnished with a stopper, and a strip of copper foil long enough to reach to the bottom, and to project beyond the surface of the liquid placed into the solution. The contents of the cylinder are shaken at intervals to accelerate reduction. After the process of reduction is completed, the precipitated metallic silver is collected on a filter, well washed with distilled water, then dissolved in pure nitric acid, and the solution evaporated. The product is chemically pure.

Presence of Gold as an Impurity in Platinum Perchloride. Prof. Gintl. (From *Ber. der deutsch. chem. Ges.*) The author draws attention to the occasional occurrence of gold in platinum perchloride, and the disturbing influence of this impurity in the application of such platinum solutions for the estimation of potassium or ammonium. The error thus introduced into the analysis is due to the reduction of the gold salt by the alcohol used in the process. The platinum salt, contaminated with gold, may be freed from this impurity by repeatedly shaking the concentrated solution with ether, which completely takes up the chloride of gold. After completely decanting the ether, the platinum solution should be evaporated until all odour of ether has disappeared, any metallic gold thus separated removed by filtration, and the filtrate heated with a little chlorine water.

Constitution of the Tartrates of Antimony. F. W. Clarke and H. Stallo. (*Amer. Journ. of Pharm.*, January, 1881.) The authors have made a study of the compounds which, like tartar emetic, are assumed to contain the group antimonyl (SbO), and come to the conclusion that they are not tartrates proper, but salts of a complex acid, called tartrantimonous acid. They analysed the barium salt formed by adding barium chloride to tartar emetic solution, and prepared also corresponding zinc and cobalt salts, the percentages of the metals found in these compounds corresponding fairly to that demanded by theory. They attempted to prepare the free acid by precipitating the barium out of the barium salts, but found the

acid very unstable; so that when the barium was removed it rapidly decomposed, depositing a white precipitate, which proved to be $\text{Sb}(\text{OH})_3$. Their theory as to the constitution of tartar emetic, then, is that it is the potassium salt of an acid in which the dyad radical $\text{C}_4\text{H}_4\text{O}_6$ enters, replacing two groups, OH , of the antimonous hydrate $\text{Sb}(\text{OH})_3$, thus:



Arsenious Sulphide as a Poison, and its Importance in Judicial Cases. J. Ossikowszky. (*Journ. für pract. Chem.* [2], xxii., 323–338, and *Journ. Chem. Soc.*, March, 1881, 123.) It is generally supposed that arsenious sulphide, whether chemically precipitated or in the form of auripigment, has no poisonous action on the living organism. A case of poisoning having occurred in which food containing arsenious sulphide was suspected, the author considers that arsenious oxide must have been present either as an original impurity or as a product by chemical change of the sulphide. A sample of auripigment was found by Sardieu to contain as an impurity much arsenious oxide, and the author considers it *à priori* possible, that during the process of putrefaction of organic bodies arsenious sulphide may be converted into oxide by the action of ozone.

A number of experiments undertaken to throw light on this subject yielded results justifying the following conclusions:—

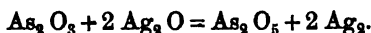
1. That during the decomposition of organic bodies easily oxidizable, bodies are oxidized, and that arsenious sulphide under such circumstances is easily converted into arsenious acid, and to a small extent into arsenic acid. The precipitated sulphide undergoes oxidation more readily than auripigment.

2. In cases of poisoning by arsenious sulphide, the oxidation products appear more or less quickly, according to the nature of the decomposing body; the presence of water and heat also exerts much influence.

The experiments leading to these conclusions are fully described in the original paper.

Estimation of Arsenious Acid in the presence of Arsenic Acid. L. Mayer. (*Journ. für pract. Chem.*, xxii., 103.) The method recommended in this paper is based upon the well-known fact that

arsenious acid reduces ammoniacal solutions of silver at a boiling heat, becoming thereby converted into arsenic acid.



After boiling the mixture for about half an hour, the precipitated silver is collected on a filter, washed with warm ammonia and water containing a little ammonium chloride, and weighed. From the weight of the silver the quantity of arsenious acid is easily calculated.

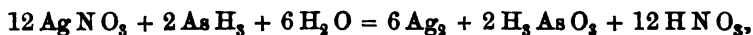
The resulting arsenic acid may then be determined as ammoniamagnesium arsenate, and by deducting from the quantity thus found that corresponding to the arsenious acid already determined, the proportion of arsenic acid originally present is found by difference.

Separation and Estimation of Arsenic in Forensic Analysis. E. Fischer. (*Ber. der deutsch. chem. Ges.*, xiii., 1778-1780.) The method proposed by Schneider and Fyfe, consisting in the separation of the arsenic as trichloride by distilling the suspected substance with hydrochloric acid, is inexact, as only arsenic existing as arsenious acid, but now present as arsenic acid, would pass into the distillate. To remedy this defect the author proposes the application of ferrous chloride as a reducing agent previous to distillation. By this modification the whole of the arsenic is obtained in the distillate as trichloride, while all the other metals of the sulphuretted hydrogen groups, including tin and antimony, remain in the retort with the iron. The arsenic in the distillate is estimated either as trisulphide or by titration with solution of iodine. To ensure success it is necessary that the hydrochloric acid solution from which the arsenic is to be distilled, is free from nitric acid; if the latter be present it must first be removed by evaporation with sulphuric acid.

Detection and Estimation of Arsenic by Marsh's Test. E. Reichardt. (*Archiv der Pharm.*, xiv., 1-23.) Instead of using Marsh's test in the ordinary way, the author prefers to rely on the action of the arseniuretted hydrogen upon a solution of silver nitrate first described by Lassaigne. He finds that the reaction succeeds best if the silver solution is strongly acidified with nitric acid. The zinc and hydrochloric acid used for generating the hydrogen should be perfectly pure, and care should be taken to keep the current of gas very slow in order to prevent any loss of arsenic. The test is so delicate that $\frac{1}{10000}$ th part of a milligram of arsenious acid is sufficient to produce a distinct reaction. The author claims

to be able, by this test, to detect arsenic in the urine of persons suffering from chronic poisoning through arsenical wall papers.

The reaction between arseniuretted hydrogen and silver nitrate is generally supposed to take place in accordance with the following equation :—



which represents the whole of the arsenic as passing into solution in the form of arsenious acid. The author, however, finds that the resulting solution always contains arsenic as well as arsenious acid, and that traces of arsenic invariably fall down with the precipitated silver. The decomposition of silver nitrate by antimoniuiretted hydrogen is generally regarded as resulting in the complete precipitation of the antimony along with the silver. It should be borne in mind, however, that a considerable portion of the antimony introduced into the gas generating bottle always remains with the zinc in the latter. Traces of antimony, moreover, are found to dissolve in the silver solution while the SbH_3 is being passed through it.

For the quantitative estimation of the arsenic the author recommends the following mode of procedure :—When the action of the gas on the silver solution has ceased and the evolution of hydrogen has also terminated, the silver solution, with the precipitate suspended in it, is mixed with an excess of bromine water, which precipitates all the silver still left in solution, as AgBr , and redissolves any trace of arsenic that may have been precipitated along with the metallic silver. After filtering to remove the silver bromide, the solution contains the whole of the arsenic as arsenic acid, which may now be determined by precipitation as ammonio-magnesium arsenate in the usual manner.

The chief novelty in the author's process is the application of a strongly acidified silver solution, which he finds to decompose the arseniuretted hydrogen much more readily and more perfectly than a neutral solution.

Chemical Toxicology of Arsenic. F. Selmi. (*Gazz. Chim. Ital.*, x., 431-437. From *Journ. Chem. Soc.*) The author points out that the great difficulty in toxicological research is to obtain reagents in quantity of absolute purity, and this is especially the case in testing for arsenic. The best method of purifying the zinc from the traces of arsenic it almost invariably contains, is to melt it in a crucible and then plunge into it a piece of sal-ammoniac, pressing it firmly against the bottom of the crucible; a lively ebullition takes

place, and the arsenic is removed as chloride; if it still contains a minute trace of arsenic, a second operation will entirely remove it. It should give no signs of blackening in Marsh's apparatus, even after the gas has passed for an hour. The author finds that the method generally recommended for purifying sulphuric acid from arsenic, namely, to add some oxidizing agent and distil, is not effective, as traces of arsenic pass over with the sulphuric acid. He recommends to add 10 to 15 per cent. of lead chloride to the sulphuric acid, and heat gradually; the chloride slowly dissolves with evolution of hydrochloric acid, which carries off the arsenic as chloride; the acid is then distilled and the first portions rejected; as soon as the distillate is found to be free from every trace of arsenic, it is collected for use.

The best method of removing the organic matter is to treat the substance by Gautier's method until most of the organic matter is destroyed, decompose the nitrous products with sulphurous anhydride, and after mixing the residue with sulphuric acid to heat it in an oil-bath at 130°C . in a current of hydrochloric acid gas, which carries off the arsenic as trichloride. The gas issuing from the apparatus is absorbed by distilled water.

A special arrangement of Marsh's apparatus is described, in which one portion of the tube, about 25–28 cm. long, is kept red-hot and the other cold, the current of hydrogen being passed slowly; in this way $\frac{1}{100}$ th mgm. of arsenic may be detected.

The author notices that arsenious anhydride is volatile to a very slight extent at 100°C ., and considerably more so at 130° ; also that when acid solutions containing arsenic are agitated with ether, the latter takes up traces of arsenic.

The author is undertaking experiments to ascertain in what state arsenic occurs in the urine of subjects poisoned with arsenic. Arsenic was administered to a large dog in doses too small to produce fatal effects, and the urine examined over a considerable period. It was found that during the first period of three days the urine contained an acid of arsenic precipitable by baryta, and another arsenical compound which was not precipitated by baryta; the same substances were found in the second period of five days, besides a volatile arsenical compound which gave a crystalline hydrochloride; subsequent to this, the arsenical base gradually disappeared.

Chemical Toxicology of Phosphorus. F. Selmi. (*Gazz. Chim. Ital.*, x., 437–442. From *Journ. Chem. Soc.*) The author first criticises the processes proposed by Scherer and by Mitscherlich

for the detection of phosphorus in the free state. In the the former, even when sulphuretted hydrogen is absent, the paper moistened with silver nitrate is occasionally blackened by the action of volatile reducing agents; to avoid this difficulty, paper and silver nitrate, absolutely free from phosphoric acid, must be used, and fresh pieces of paper are employed successively until they cease to be blackened; the papers are then incinerated, and the residue tested for phosphoric acid. Instead of Mitscherlich's process, it is proposed to distil the suspected substance with water in a current of carbonic anhydride, agitate the aqueous distillate with carbon bisulphide to take up the phosphorus, add a little absolute alcohol to the separated bisulphide, and allow the latter to evaporate. In this way an alcoholic solution of phosphorus is obtained which is divided into two portions, to one of which is added an alcoholic solution of mercuric iodide, and to the other silver nitrate; if phosphorus is present, a yellow coloration will be produced by the former, and a brown by the latter, with subsequent deposition of brown flocks. The green coloration which phosphorus gives to the hydrogen flame may also be employed in testing the alcoholic solution.

It is stated that in cases of poisoning by phosphorus it is useless to examine the urine; this, however, is incorrect. Tested by the modification of Scherer's method above described, phosphorus can be detected. If the urine is rendered alkaline with baryta-water and then precipitated by adding absolute alcohol, the precipitate gives the reactions of the lower acids of phosphorus with nascent hydrogen. On distilling the alcoholic filtrate, a volatile neutral principle passes over, containing phosphorus and also a phosphorus base.

An examination of the brain and liver of a subject poisoned with phosphorus gave similar results: the lower acids of phosphorus could be detected, as well as neutral and basic phosphorus compounds similar to those found in urine.

The Detection of Phosphorus in Poisoning Cases. Dr. H. Hager. (*Pharmaceut. Centralhalle*, xx., 353.) The author employs Scherer's method of detecting the phosphorus by the blackening effect of its vapour on a strip of paper moistened with solution of silver nitrate. In order to remove any sulphuretted hydrogen present, he mixes the substance under examination (food, contents of stomach, fæces, etc.) with solution of subacetate of lead, then shakes a portion of the mixture with ether in a flask, and closes the latter with a well-fitting cork, to which the strip of moist silver nitrate

paper is attached, so that the latter is well exposed to the vapour of ethereal phosphorus solution. If but small traces of phosphorus be present, the blackening of the paper may not become perceptible within less than half an hour, while in the presence of a larger proportion of phosphorus, the discoloration will be observed in the course of a few minutes. The mixture should not be heated.

Another process recommended by the author consists in the extraction of the phosphorus from the substance under examination by shaking with petroleum ether, then decanting the latter, and placing it in a flask fitted with a cork and a strip of moist silver nitrate paper, as in the above process, and allowing the mixture to stand. He also recommends to allow a portion of the petroleum ether solution to evaporate spontaneously in a shallow dish to about one-tenth of its volume, and to pour the residue upon a plate in a dark room. Upon moving the plate so that the concentrated solution rapidly evaporates, the plate will present a luminous surface.

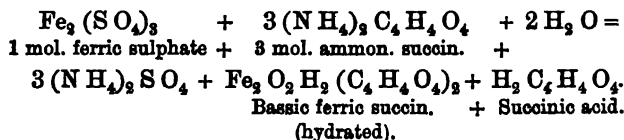
The Analysis of Ferrum Redactum. O. Wilner. (*Pharm. Zeitung*, 1880, No. 93, from *Farm. Tidschrift*, August, 1880.) The sample is gently heated with an excess of saturated solution of mercuric chloride; mercurous chloride, and metallic mercury are hereby precipitated, while the metallic iron present in the sample passes into solution as ferrous chloride, and may be titrated with potassium permanganate. The ferrous and ferric oxides present remain undissolved, and therefore do not interfere with the estimation of the metallic iron. The proportion of ferrous oxide in the preparation may be estimated by digesting the undissolved portion with hydrochloric acid in a closed flask until the oxides of iron are dissolved, and then determining the ferrous chloride thus formed by titration with potassium permanganate. The ferric chloride, which is formed along with the ferrous, is said to have no appreciable action upon the precipitated metallic mercury and mercurous chloride.

The author finds that reduced iron contains the two oxides (ferrous and ferric) in variable proportions, and not in the form of ferroso-ferric oxide, Fe_3O_4 , as is generally supposed.

Ferric Succinate. Prof. W. T. Wenzell. (*New Remedies*, February, 1881.) This preparation has been recently introduced, and used with success as a remedy for jaundice resulting from obstruction of the biliary duct by calculi.

Ferric succinate, in a hydrated state or dried, presents a cinnamon-brown amorphous substance, quite insoluble in water. It is readily

prepared by adding to a solution in water of an alkaline succinate, a solution of ferric sulphate, as long as a precipitate is obtained. The reaction takes place between 1 molecule of ferric sulphate and 3 molecules of the neutral or normal ammonium succinate, and with the assimilation of 2 molecules of water :—



Hydrated ferric succinate occurs in the form of an amorphous precipitate, containing 1 molecule of water, of which it is deprived on drying, and converted into the basic salt $\text{Fe}_2 \text{O} (\text{C}_4 \text{H}_4 \text{O}_4)_2$.

The hydrated salt is insoluble in a cold solution of succinic acid or ammonium succinate, more soluble in boiling solutions, from which it separates slowly on cooling. It is more soluble in ammonium citrate, even at ordinary temperatures.

A solution of ferric succinate in ammonium citrate is quite permanent, and can be mixed with succinic acid and ammonia without decomposition. An excess of ammonia merely deepens the colour. The solution, evaporated at a temperature not exceeding 133°F ., solidifies, on cooling and standing for a time, into a crystalline mass. By experimental synthesis, working with exact molecular weights, it was found that three molecules of ammonium citrate were required to dissolve one molecule of the precipitated ferric succinate, and from these data the following composition of the double salt of ferric succinate and ammonium citrate has been deduced: $\text{Fe}_2 \text{O} (\text{C}_4 \text{H}_4 \text{O}_4)_2 \cdot 3 (\text{NH}_4)_2 \text{C}_6 \text{H}_5 \text{O}_7$, and from this molecular formula a working formula for its preparation has been calculated.

Liquor Ferri et Ammonii Succinatis. Dissolve 50 grains of succinic acid in 3 fluid ounces of water, neutralize nearly with ammonia, and dilute to 6 fluid ounces. Transfer the solution to an 8-ounce bottle, add half a fluid ounce of the official liquor ferri persulphatis, and agitate well. Transfer the mixture to filter, and wash the precipitated ferric succinate thoroughly with distilled water. Next take 89 grains of citric acid, put it into a beaker, and add, with stirring, a sufficient quantity of water of ammonia until the acid is dissolved and the solution neutral.

Finally, transfer the moist ferric succinate to a porcelain capsule, add the solution of ammonium citrate, and dissolve, assisted by

a gentle heat. This solution, when diluted to measure six fluid ounces, will contain to the fluid drachm two grains of the ferri succinate, $\text{Fe}_2\text{O}(\text{C}_4\text{H}_4\text{O}_4)_2$, or five grains of the double salt.

Two New Oxides of Bismuth. M. M. P. Muir. (From a paper read before the Chemical Society, June 16th, 1881.) The pure coloured compound formed during the action of potassium cyanide solution on a hot nitric acid solution of bismuth nitrate, is an oxide of the formula Bi_3O_7 , and not $\text{Bi}_2\text{O}_3, 2\text{H}_2\text{O}$, as asserted by Boedeker. If this heptoxide is treated with hot concentrated solution of potassium hydrate, it is partially dissolved, leaving a reddish brown residue, which, after washing with hot water, proves to be an oxide of the formula Bi_4O_7 .

The physical and chemical characters of both oxides are described in the paper.

Bismuth Subnitrate. A. Riche. (*Journ. de Pharm. et de Chim.* [5], 384.) The author finds that the majority of commercial samples of this preparation contain lead and arsenic, the former to the extent of 0.03–0.34 per cent. (sulphate), and the arsenious acid to 0.002–0.01 per cent.

Analysis of Bismuth Subnitrate. E. Baudrimont. (*Journ. de Pharm. et de Chim.* [5], 368.) The method recommended by the author for the estimation of the nitric acid in this preparation consists in the decomposition of a weighed quantity of the salt with a known volume of a standard soda solution, and the determination of the excess of alkali in a measured portion of the filtrate. The soda solution employed by him contains 7.407 grains of NaHO per litre, and the corresponding sulphuric acid 9.074 of H_2SO_4 per litre. 1 grain of the subnitrate to be examined is boiled for ten minutes in a flask with 20 c.c. of the soda solution and 30 c.c. of water, the boiled mixture, after cooling, made up to 100 c.c., and passed through a dry filter. 50 c.c. of the filtrate are now titrated with the sulphuric acid, the number of c.c. of acid used deducted from 50, and the difference calculated for nitric acid.

The bismuth is estimated by washing, drying, and weighing the precipitate, or by igniting a fresh portion of the subnitrate in a crucible, and weighing the residual oxide.

Separation of Copper from Cadmium. G. Vortmann. (*Zeitschr. für analyt. Chem.*, 1881, 416.) The author's method is based on the different behaviour of sodium hyposulphite towards solutions of the two metals; the copper is precipitated as sulphide, while the cadmium remains in solution.

The diluted sulphuric or hydrochloric acid solution of the two

metals is mixed with sufficient hyposulphite to cause complete decolorization, and the mixture boiled for about five minutes. The precipitated cuprous sulphide is collected and washed, then mixed with sulphur and ignited in a current of hydrogen. The cadmium may be precipitated from the filtrate either as carbonate or sulphide.

Decomposition of Verdigris by Water at High Temperatures. P. Cazenueve. (*Journ. de Pharm. et de Chim.* [5], 409.) When ordinary verdigris is heated with water at 200°C . in sealed tubes, it is at first decomposed into cupric oxide and neutral acetate. As the heat is continued carbon dioxide is evolved, and the cupric oxide is ultimately converted into cuprous oxide. At the same time glycollic acid is formed, part of which combines with the lime which is nearly always present as an impurity in the verdigris.

Distribution of Copper in the Animal Kingdom. G. Bizio. (*Gazz. Chim. Ital.*, x., 149.) This paper gives a complete historical survey of the labours of the various chemists who have investigated this subject.

A New Sulphate of Aluminium. P. Marguerite. (*Comptes Rendus*, xc., 1354-1357.) The new sulphate described by the author has a composition answering to the formula $\text{Al}_2\text{O}_3, 2\text{SO}_3, 12\text{H}_2\text{O}$. It is obtained by heating ammonium alum until it is reduced to anhydrous aluminium sulphate, and then carefully raising the temperature to expel one-third of the sulphuric acid. The salt crystallizes in rhombohedrons, and is soluble in water at an ordinary temperature to the extent of 45 per cent. It may be freed from any undecomposed portion of the ordinary sulphate by fractional crystallization.

Preparation of Potassium Iodide from Kelp. E. Allary and J. Pellieux. (*Bull. de la Soc. Chim.* [2], xxxiv., 627-630. From *Journ. Chem. Soc.*) The mother-liquors, from which the chlorides and sulphates have been separated, are evaporated to dryness in a furnace of special construction, and the residue is carefully roasted, until all the sulphur is either expelled or oxidized. No iodine is lost in this operation. It is necessary to stop the roasting as soon as the sulphur compounds are completely oxidized; this may be ascertained by withdrawing samples from time to time. The calcined mass is broken up and subjected to methodical lixiviation with cold water in a small Shanck's apparatus. The solution, when evaporated to dryness, gives a white salt which contains about 50 per cent. of iodides. This salt is powdered, and introduced into a Dorrault's digester, which may be used either as an extractor

or as a still. In this it is treated with warm alcohol, which dissolves out the iodides. When the extraction is complete, the alcohol is distilled off in the same apparatus, and used again. The salt thus obtained is a mixture of potassium and sodium iodides, containing on an average 34 per cent. of the former and 66 per cent. of the latter. To convert the sodium iodide into the potassium salt, its amount is determined, and to the saturated aqueous solution of the mixed salts is added a saturated solution of potassium carbonate, containing an amount equivalent to the sodium iodide present, and a stream of cooled carbonic anhydride from the furnaces is passed into the mixture. The following reactions take place:—(1) $2 \text{Na I} + \text{K}_2 \text{C O}_3 = 2 \text{K I} + \text{Na}_2 \text{C O}_3$; (2) $\text{K I} + \text{Na}_2 \text{C O}_3 + \text{H}_2 \text{O} + \text{C O}_2 = \text{K I} + 2 \text{Na H C O}_3$. When the conversion of the sodium carbonate into bicarbonate is complete, the crystals of the latter are removed, and the small quantity of bicarbonate remaining in solution is exactly decomposed by means of hydrochloric acid. The solution then contains potassium iodide, mixed with a small quantity of sodium chloride, which may be separated by repeated crystallization. All the residues are worked up in the treatment of fresh quantities of kelp, and thus loss of iodide is avoided.

To prepare pure potassium iodide, the salt obtained by the above method is treated with alcohol, and the dissolved iodide recrystallized.

Estimation of Chlorine in Potassium Iodide and Potassium Bromide. O. Schlickum. (*Pharmaceut. Zeitung*, 1881, 45.) The principle of the author's method of determining the chlorine present as an impurity in potassium iodide, consists in the precipitation with an excess of silver nitrate, treatment of the washed precipitate with solution of ammonia to extract the silver chloride, and the addition to the ammoniacal filtrate of a standard solution of potassium iodide until the silver is completely precipitated. The standard solution he employs contains one per cent. of potassium iodide. As it would be impracticable to insist on the absolute freedom from chloride, he considers an allowance of one per cent. of chlorine in the iodide as a fair limit, which ought not to be exceeded. The presence of more than one per cent. may be readily detected in the following manner:—

One gram of the iodide to be tested is dissolved in distilled water, and the solution made up to 100 c.c. Of this solution 10 c.c. = 0.1 gram of K I, are precipitated with an excess of silver nitrate; the precipitate is collected on a small filter, well washed with distilled water, then repeatedly exhausted with small quantities of ammonia

solution (amounting in all to about 5 or 6 c.c.), mixing the entire ammoniacal filtrate with one-half c.c. of the same potassium iodide solution (the quantity corresponding to one per cent. of chlorine), filtering, and testing one-half of the clear filtrate with another drop of the KI solution, and the other half with silver nitrate. The latter ought to produce a precipitate, but not the former.

Potassium bromide is tested in a similar manner. Of the solution containing one per cent. of the salt, 30 c.c. are submitted to the test, and the ammoniacal filtrate obtained as above is mixed in this case with 1 c.c. of the KBr solution. The filtered mixture ought to form a precipitate with silver nitrate, but none with a further drop of the bromide solution.

Colorimetric Determination of Chlorine in Potassium Bromide. C. Roth. (*Chem. News*, from *Correspondenz Blatt des Ver. deutsch. chem.*, 1880, No. 15.) One gram of potassium bromide is ground to a powder with an approximately equal quantity of potassium bichromate, placed in a flask holding 100 c.c., and covered with 5 c.c. concentrated sulphuric acid. The flask is then connected air-tight, by means of an adaptor ground to fit its mouth, with a receiver containing 100 c.c. very dilute ammonia (five or six drops of caustic ammonia to 100 c.c. of water). A gentle heat is applied and raised to about 128°. There should be two large bulbs blown on the connection tube, to prevent the reflux of the liquid. When all the chlorine has thus been expelled, the distillate is compared with solutions of ammonium chromate of known strength prepared for the purpose.

Impure Potassium Bromide. O. Maschke. (*Pharmaceut. Zeitung*, 1880, 728.) The author calls attention to the occasional presence of not inconsiderable quantities of lead in this salt. The crystals thus contaminated do not form a perfectly clear solution with water. Sulphuric acid fails to indicate the lead, as lead sulphate is soluble in the solution of potassium bromide; but potassium chromate or ammonium sulphide at once reveals its presence.

Potassium Tetrachromate. G. Wyrnuboff. (*Bull. de la Soc. Chim.* [2], xxxv., 162.) The author shows that the salts described by Darmstaedter as potassium nitro-dichromate and nitro-trichromate consist of potassium tetrachromate containing some nitrate as an impurity, which it is difficult entirely to remove.

Preparation of Potassium Ferriocyanide. K. Seuberlich. (*Dingl. polyt. Journ.*, ccxxxviii., 482, and *Amer. Journ. of Pharm.*, 1881, 233.) The author has tested the conditions under which ferrocyanide of potassium is changed by the action of lead peroxide

in alkaline solution into the ferricyanide of potassium. His results agree with those previously obtained by Lunge, who found that a complete change was only reached when the liberated alkali was neutralized by an acid. The change succeeds perfectly in the cold when the solution of ferrocyanide is treated with lead peroxide, and then a slight excess of dilute hydrochloric acid added with constant stirring. When red lead is used higher temperatures and larger excess of acid are necessary.

The change to ferricyanide can also be effected by the aid of manganese dioxide, even in the cold, if to 1 molecule of ferrocyanide of potassium 1 of the manganese dioxide is used. In both cases there is obtained from the filtrate, after neutralizing with soda, a very pure salt, although in the second case the liquid is difficult to filter. The author believes that by the addition of carbonates and by the blowing in of a current of air, the manganese sesquioxide precipitate can be oxidized so that it will give no trouble in washing. Upon adding a base, this manganese precipitate is readily converted into dioxide again. Either of the above-mentioned methods seems adapted to replace the old chlorine method.

A New Test for Potassium. L. L. de Koninck. (*Zeitschr. für analyt. Chem.*, 1881, 390.) A ten per cent. solution of sodium nitrite, mixed with a little cobalt chloride and acetic acid, forms a yellow precipitate with potassium solutions, even if the latter be so weak that platinum perchloride fails to precipitate them. This test is a reversed application of the well-known reaction between cobalt and potassium nitrite. With ammonium salts the test is much less delicate than with salts of potassium. With magnesium, calcium, barium, strontium, aluminium, and iron, this reagent produces no precipitates.

Preparation of Chemically Pure Soda. MM. Endemann and Prochazka. (*Chem. Industrie*, iii., 273.) The method recommended by the authors is based upon the fact, observed by Gerresheim, that any chlorine or sulphuric acid present in soda may be completely removed from it by shaking the solution with Millon's base, the product obtained by the action of ammonia on mercuric oxide. For the purpose of this purification, 2 litres of soda solution are agitated with 30 grams of the said base, twice daily for a week, after which the separation of chlorine and sulphuric acid is complete. As Millon's base always contains some free ammonia, however well it may be washed, the authors suggest the addition of some mercuric oxide to the soda solution, for the removal of this ammonia.

Ammonium Bicarbonate as an Impurity in Bicarbonate of Sodium. A. Koster. (*Archiv der Pharm.*, 1880, xiv., 31.) The author examined a sample of sodium bicarbonate of English manufacture, which conformed to all the requirements of the German Pharmacopoeia, excepting the test with mercuric chloride. With the latter reagent it formed a copious white precipitate, which he found to be caused by the presence of ammonium bicarbonate amounting to nearly four per cent. He attributes the presence of this impurity to the fact that sodium bicarbonate is now largely made by the so-called ammonia process.

Preparation of Soda from the Sulphate by means of Lime and Sulphur. F. Gutzkow. (*Dingl. polyt. Journ.*, cxxxvi., 148-158. From *Journ. Chem. Soc.*) The author has patented a method of preparing caustic soda from sodium sulphate, by treating the latter with calcium sulphite, and introducing sulphurous acid gas into the mixture. Soluble calcium bisulphite is thus formed, which reacts with the sodium sulphate, forming calcium sulphate and sodium bisulphate. These are separated by filtration, and the gypsum washed out with hot water. The sodium bisulphite is then treated with milk of lime, whereby a solution of caustic soda is obtained, which contains a certain proportion of sodium sulphite and sulphate and also calcium sulphite. It is evaporated in the usual manner, and the calcium sulphite which is left after decantation is used in another operation. The following two questions presented themselves to the author in working out this method:— (1) To what extent can sodium sulphate be transformed into the sulphite by means of lime and sulphurous acid; and (2) To what extent can sodium sulphite be rendered caustic by lime? As regards the first question, the conversion of sodium sulphate into sulphite is very satisfactory, and might be regarded as complete, if it were not for the solubility of the calcium sulphate, which is greater in the solution than in pure water. In the subsequent treatment with lime this has a tendency to reconvert part of the sodium sulphite into sulphate. The second question could not be solved in a satisfactory manner, although success depends in a great measure on the solution being sufficiently dilute; but even with 14 grains per litre, only 87 per cent. was converted. The results obtained, however, were only approximate, and, therefore, could not be used as proper data for answering this question. It was found that sodium sulphite requires a greater dilution than the carbonate.

Details of the apparatus and the mode of working are given.

A Delicate Test for Caustic Alkalies. W. Bachmeyer. (*Zeitschr. für Analyt. Chem.*, 1881, 234.) Caustic alkalies, especially ammonia, produce in tannin solutions a red or reddish brown coloration, which after some time passes into a dirty green. This reaction is so delicate that a solution of one part of caustic potash or ammonia in 1,000,000 parts of water yields a perceptible coloration if mixed with the tannin solution and allowed to stand for some time. It greatly surpasses litmus paper in this respect, and may therefore be employed with advantage for the detection of traces of free alkalies and their normal carbonates. It may also be used for detecting traces of caustic alkalies in the presence of alkaline carbonates, for which purpose the former are first separated from the latter by means of alcohol.

The Synthesis of Ammonia. G. S. Johnson. (From a paper read before the Chemical Society, January 20th, 1881.) Some experiments, in which pure nitrogen was passed over heated copper containing occluded hydrogen, suggested to the author the possibility of the formation of ammonia; only minute traces were formed. On passing, however, a mixture of pure nitrogen (from ammonium nitrite) and hydrogen over spongy platinum at a low red heat, abundant evidence was obtained of the synthesis of ammonia. The gases were passed, before entering the tube containing the platinum, through a potash bulb containing Nessler's reagent, which remained colourless. On the contrary, the gas issuing from the platinum rapidly turned Nessler's reagent brown, and in a few minutes turned faintly acid litmus solution blue; the odour of NH_3 was also perceptible. In one experiment 0.0144 gram of ammonia was formed in two hours and a half. The author promises further experiments as to the effect of temperature, rate of the gaseous current, and substitution of palladium for platinum.

The Preparation of Ammonium Bromide. E. Biltz. (From *Vorschläge zur Abänderung der ersten Auflage der Pharmacopoea Germanica*, 1880.) The author has critically examined the various processes in use for the preparation of this salt, and selected the following as the one to be recommended in preference to all others:—

The bromine is covered with twice its weight of water in a flask, and solution of ammonia added in small successive portions, while the flask is kept cool by partial immersion in cold water, and gently shaken after each addition. When sufficient ammonia has been used to render the mixture colourless, bromine water is added in slight excess, so that the solution appears again faintly yellow.

The solution now contains bromide, bromate, and hypobromite of ammonium, and a small proportion of free bromine. Sulphuretted hydrogen is then passed through the liquid with the object of reducing the bromate and hypobromite to bromide, and to convert the free bromine into hydrobromic acid. The excess of sulphuretted hydrogen is expelled by boiling, and the precipitated sulphur removed by filtration through a double filter. The perfectly clear liquid is now mixed with an excess of solution of ammonia, and evaporated to dryness.

The product is free from all impurities except a minute proportion of chloride emanating from the chlorine contained in the bromine.

New Combinations of Ammonia with Hydrochloric, Hydrobromic, and Hydriodic Acids. L. Troost. (*Comptes Rendus*, lxxviii., 715.) The author has shown that besides sal ammoniac there exist at least two other compounds of hydrochloric acid and ammonia, viz., tetra- and hepta-ammoniacal hydrochlorates, H Cl. 4 N H_3 , and H Cl. 7 N H_3 . With hydrobromic and hydriodic acids, ammonia forms, besides the normal salts (H Br N H_3 and H I N H_3), di-, tetra-, and hepta-ammoniacal combinations, so that each of these two acids combines with ammonia in four different proportions.

Estimation of Lithium as Phosphate. G. Merling. (*Zeitschr. für Analyt. Chem.*, 1880, 563.) The accuracy of the method of estimating lithium as orthophosphate having been called into question, the author has confirmed its trustworthiness by preparing pure lithium carbonate from lepidolite, and precipitating a known quantity as phosphate: after observing all due precautions detailed below, 104.53 per cent. was found instead of 104.50.

Lithium carbonate, prepared from lepidolite, was dissolved in hydrochloric acid; all metals except magnesium were separated by treatment successively with sulphuretted hydrogen, ammonia, ammonium sulphide, and small quantities of ammonium carbonate. The magnesium was completely separated by boiling with lithium hydrate, prepared by the action of silver oxide on the chloride. The solution was then considerably concentrated by evaporation, and precipitated by ammonia and ammonium carbonate; the lithium carbonate was boiled twenty times with small quantities of water to free it from chloride, then disseminated in a large quantity of cold water through which a stream of washed carbonic anhydride was passed. The clear filtered liquid was boiled, and the precipitated lithium carbonate several times washed with boiling water and dried. No foreign substances could be detected in this salt.

The process of estimation was carried out as follows:—A known weight of this salt was dissolved in hydrochloric acid, and the solution was mixed with ten times its weight of crystallized sodium phosphate and sufficient caustic soda to make it decidedly alkaline; it was then evaporated to dryness on a water-bath, and the residue was allowed to stand for twelve hours with sufficient 2·5 per cent. ammonia solution to dissolve all the soluble salts; the phosphate was then washed for a long time with dilute ammonia. The filtrate and wash-water were united and subjected twice to the same process after addition of a little caustic soda, after which the third treatment yielded only 0·6 mgrm. of phosphate. All evaporations were conducted in platinum, but the ignited phosphate left 7·7 mgrm. of silica on solution in hydrochloric acid, the silica probably arising from the caustic soda.

Lengthened washing of the precipitated phosphate with dilute ammonia is indispensable. Lithium orthophosphate dissolves when boiled with ammonium chloride solution with evolution of ammonia, and its purity may thus be ascertained. The decomposition which occurs is as follows:— $\text{Li}_3\text{P O}_4 + 2 \text{N H}_4 \text{Cl} = \text{Li H}_2\text{P O}_4 + 2 \text{Li Cl} + 2 \text{N H}_3$.

Metaphosphate and Pyrophosphate of Lithium. G. Merling. (*Zeitschr. für Analyt. Chem.*, 1879, 563–568. From *Journ. Chem. Soc.*) Lithium metaphosphate is obtained by evaporating the solution of lithium carbonate in excess of phosphoric acid. The most suitable proportions are two molecules of lithium oxide to three of phosphoric anhydride. When the temperature during evaporation reaches 130° , a soluble crystalline salt separates, which contains $6 \text{Li}_2\text{O}$, $5 \text{P}_2\text{O}_5$, $8 \text{H}_2\text{O}$; it consists of ortho- and pyro-phosphate. On continuing the evaporation, this salt redissolves, and as soon as the excess of metaphosphoric acid begins to be evolved as white fumes, the lithium metaphosphate crystallizes; the thick mass is boiled with water, when the metaphosphate remains as an insoluble heavy powder. The crystals are large or small, according as more or less than the above proportion of phosphoric acid has been employed. It is probably a monometaphosphate.

This process also yields the sodium and potassium metaphosphates in a crystalline condition.

Analysis of the lithium salt by the method of Kraut, Nahnsen, and Cuno (*Annalen*, clxxxii., 165), proved its composition to be that of lithium metaphosphate.

Lithium metaphosphate is a white crystalline powder, consisting of well-formed microscopic tables. It is insoluble in boiling water,

slightly soluble in acetic acid, and easily soluble in hydrochloric, nitric, sulphuric, and phosphoric acids. Its sp. gr. is 2.461. At an incipient red heat it melts to a colourless hygroscopic glass of 2.226 sp. gr., which is soluble in water with feebly acid reaction, and insoluble in alcohol.

Lithium pyrophosphate is prepared by dissolving Kraut's sodium lithium pyrophosphate in acetic acid, precipitating with alcohol, washing the bulky precipitate with alcohol, and drying. The salt contains $2\text{H}_2\text{O}$; heated to 100°C . it loses 7.03 per cent., and if melted 14.55 per cent. of water. The salt dried at 100° is still pyrophosphate.

Sodium Arseniate. G. Fleury. (*Journ. de Pharm. et de Chim.* [5], ii., 367.) If the ordinary commercial arseniate of sodium be exposed to a moist atmosphere for at least twelve days at a temperature of about 20°C ., it absorbs a considerable amount of moisture, and is ultimately converted into a salt containing 14 molecules of water.

Sodium Hyposulphite. P. Schützenberger. (*Comptes Rendus*, xcii., 875.) The author disputes the correctness of the usually adopted formula of this salt, and maintains that its real composition is represented by the formula NaHSO_3 .

Action of Sulphur Dioxide on the Alkaline Earths. K. Birnbaum and C. Wittich. (*Ber. der deutsch. chem. Ges.*, xiii., 651.) Baryta slowly absorbs sulphur dioxide at 200°C ., and more rapidly at a somewhat higher temperature; in the case of strontia no absorption takes place below 230° , with magnesia the absorption only begins at 326° , while in the case of lime a temperature of 400° is required before the absorption commences. The products in the cases of baryta, strontia, and magnesia, are BaSO_3 , SrSO_3 , and MgSO_3 respectively; but the combination formed with lime is a basic sulphite corresponding to the formula $\text{Ca}_2\text{S}_2\text{O}_6$.

Recognition and Determination of Traces of Carbon Bisulphide. A. W. Hofmann. (*Ber. der deutsch. chem. Ges.*, xiii., 1732.) The author states that minute quantities of carbon bisulphide occur in all samples of mustard oils. Thus in the oil from *Sinapis juncea* he found, in two determinations, 0.41 and 0.37 per cent; in the oil from *Sinapis nigra*, 0.51 and 0.56 per cent.; and in artificial oil, made from allyl iodide and ammonium sulphocyanate, 0.32 per cent. of carbon bisulphide. The small amounts can be shown qualitatively by the aid of the xanthogenate of copper reaction, but not determined quantitatively. The slightest trace, however, may be accurately determined by means of triethylphosphine, with which

carbon bisulphide yields pinkish red crystals of the compound $\text{Et}_3\text{P CS}_2$. For this purpose the substance containing the carbon bisulphide is placed in a retort connected with a receiver and with two or three test-tubes, which contain some triethylphosphine floating on caustic soda. The retort is heated on a water-bath, and a current of dry carbonic anhydride passed through the whole apparatus; in this manner all the carbon bisulphide present is brought in contact with the triethylphosphine, and the above-mentioned compound is formed. At the end of the experiment the red compound is collected on a weighed filter, dried in a vacuum, and weighed.

Solubility of Bisulphide of Carbon in Water. W. T. Page. (*Zeitschr. des oesterr. Apoth. Ver.*, 1881, 169.) It is well known that bisulphide of carbon is slightly soluble in water. The author has determined the amount of this solubility at various temperatures, with the following results:—

| | | | |
|-----------------------|-----------|----------|--------------------------------|
| 100 parts of Water of | 12–18° C. | dissolve | 0.200 parts of CS_2 . |
| " " " | 15–16° C. | " | 0.191 " " |
| " " " | 25–27° C. | " | 0.168 " " |
| " " " | 30–33° C. | " | 0.145 " " |

The Liquefaction of Ozone. MM. Hautefenille and Chapuis. (*Comptes Rendus*, xci., 522.) By exposing a mixture of oxygen and ozone, rich in the latter, to a gradually increasing pressure at a low temperature, the authors observed the gas to assume a blue colour; and at the moment of release after a compression equal to seventy-five atmospheres there was an appearance of a white mist, indicating liquefaction. The keeping up of a very low temperature during the operation was found to be an essential condition of success, as otherwise the ozone decomposed with an explosion accompanied by a flash of light.

The authors intend further to investigate the cause of the blue colour observed before liquefaction.

Report on the Atmospheric Oxidation of Phosphorus and some Reactions of Ozone and Peroxide of Hydrogen. C. T. Kingzett. (Abstract of a paper read before the Chemical Society, Nov. 4, 1880. From *Pharm. Journ.*) The paper commences with a historical *résumé* of previous researches by Schönbein, Andrews, Marignac, Corne, Boehe, Leeds, MacLeod, and himself. In the present research the author employed a series of glass-stoppered bottles; each fitted with two glass tubes ground into holes in the stopper, thus avoiding altogether the use of cork and indiarubber. He concludes

that both ozone and peroxide of hydrogen are produced by the oxidation of phosphorus, the peroxide of hydrogen remaining almost entirely in the water in which the phosphorus is oxidized. The ozone passes on in the air current, and after washing and drying with strong H_2SO_4 was estimated by the amount of iodine liberated in an acidified solution of potassium iodide. A large number of experiments were made; in several cases the proportion of peroxide of hydrogen to the ozone produced was approximately 1 to 2. The ozone was entirely destroyed at 240° and by passing through oil of turpentine. It was, however, not destroyed by passing through a ten-volume solution of hydrogen peroxide. Ozone, when it acts on oil of turpentine, gives rise to the same peroxidized compound as is formed by the absorption of oxygen. The turpentine which has absorbed ozone when treated with water produces an equivalent amount of peroxide of hydrogen. Similar observations are recorded with ether. As regards the estimation of peroxide of hydrogen, the author finds that the ordinary process with potassium iodide and starch may be much shortened by employing a large excess of dilute sulphuric acid. When it is estimated by the amount of oxygen evolved with potassium permanganate, the author advises that no acid be added, as a mixture of potassium permanganate and dilute sulphuric acid gradually gives off oxygen until all the permanganate is decomposed.

The Ozonization of Moist Air by Phosphorus. Dr. A. R. Leeds. (*Chem. News*, xliii., 97-100.) The author's experiments, described in this paper, lead to the following conclusions:—

Both ozone and hydrogen peroxide are produced during the ozonization of purified air by moist phosphorus, in the ratio approximately of one molecule of the latter to one of the former.

Both bodies are evolved, the suspended hydrogen peroxide passing through a series of wash-bottles without undergoing any but a slight absorption, and being present in the evolved gas in nearly the same ratio as that which it held to the ozone when originally produced.

Along with these two bodies, and as a necessary part of the same series of reactions incident originally to the setting free of nascent oxygen, a certain amount of nitrate of ammonium is invariably produced. This last is altogether detained in the water of the ozonator and of the wash-bottle.

Atmospheric Ozone. E. Schöne. (*Bull. de la Soc. chim.* [2], xxxiv., 337.) The author denies that any satisfactory proof has ever been given of the presence of ozone in the atmosphere, since

the various reagents which have been used for its detection are equally affected by hydrogen peroxide. In the place of iodized starch papers, he prefers papers impregnated with hydrated thallium oxide as indicators of ozone or peroxide of hydrogen. The intensity of coloration varies with the light, cloudiness of the sky, and direction of wind.

Hydrogen Peroxide. A. H. Mason. (*Chem. and Drug.*, 1881.) This paper contains a useful *résumé* of the literature relating to the preparation, properties, detection, estimation, and applications of peroxide of hydrogen.

Rapid Mode of Estimating Carbonic Anhydride in the Atmosphere. M. Kapoustin. (*Bull. de la Soc. Chim.* [2], xxxiv., 219.) The author agitates a definite volume of air with a solution of soda in alcohol of 90 per cent., and deduces the amount of carbonate thus precipitated from the proportion of water required to dissolve it.

Variations in the Proportion of Carbonic Anhydride in the Atmosphere. P. Hasselbarth and J. Fittbogen. (*Bied. Centr.*, 1880, 161-164.) In this paper the authors record the results of their observations relating to the influence of the state of the weather, direction of wind, and the seasons of the year on the proportion of carbonic anhydride in the atmosphere.

Variations in the Composition of the Atmosphere. P. v. Jolly and E. W. Morley. (*Bied. Centr.*, 1880, 230, and *Journ. Chem. Soc.*, 1880, 698.) The first-named author employs two methods for the estimation of atmospheric oxygen and nitrogen; the results of both fully correspond. First, the weighing of a definite volume of air in conjunction with the estimation of the sp. gr. of oxygen and nitrogen, and afterwards the direct endiometric analysis of the air; the direction of the wind currents, too, must be closely observed. The end result of the observations shows that the oxygen of the atmosphere is subject to not inconsiderable variations. In the year 1877 the amount of oxygen varied from 21.01 to 20.53 per cent.; in the years 1875-76, 20.96-20.47 per cent.; in both years the highest figures were obtained during north, and the lowest during the prevalence of southerly winds, but it is not affirmed that these directions of the air currents are always accompanied by or are a cause of these phenomena. A change of wind, however, from one to other of these directions is generally followed by a variation of a half of a per cent. in the composition of the air, and a brisk, rapidly-changing wind is the best condition for obtaining well mixed air. Further observations are looked forward to, to show that notwithstanding the richer vegetation of the tropics, the process of oxidation

is more active there than that of reduction, whilst the reverse is taking place in northern regions.

Morley, in the *American Journal of Science*, takes the foregoing experiments into consideration, and says that if Jolly's results are trustworthy, and show, by an examination of the air of the temperate zone, such differences, after travelling thousands of miles and being blended with the air of intermediate countries, the actual difference when estimated near the pole and the equator must be great indeed, and greater than there is any reason for supposing. He therefore thinks further research necessary. According to a theory recently propounded by Loomis, the sudden lowerings of temperature are not caused by the passage of cold currents of air from higher to lower latitudes, but rather by the vertical descent of masses of cold air from the upper regions of the atmosphere to the lower. Morley says if this be the case, it is easy to understand that during the lowering of the temperature, the air in the vicinity of the earth's surface should contain less than the average amount of oxygen, and that a sample of air taken from such a descending mass is in reality a sample of the upper stratum of the atmosphere before mixing with the underlying strata, and it is also possible that if that sample was part of a mass which had long been in the higher regions, it might have lost some of the oxygen which it contained when resting on the surface of the ocean. He also directs attention to the fact that Jolly's analysis showed the following quantities of oxygen:—20·48–20·50, 20·49–20·46, 20·56, and that in Fehling's "*Neues Handwörterbuch der Chemie*," an analysis of air from the Bay of Bengal gives oxygen at 20·46, one from the neighbourhood of Calcutta, 20·39, and from the vicinity of Algiers, 20·41. So that from this it is improbable that such great differences really exist.

Solubility of Chlorine in Water. M. Berthelot. (*Comptes Rendus*, July 26th, 1880.) The rate of solubility of chlorine in water depends not only on the temperature but also on the influence of light and the duration of the passage of the gas. At 12° C. and normal pressure, a litre of water absorbs 4 grams of gas; but by a long-protracted passage of the gas, as much as 6 grams can be obtained in solution. In the author's opinion this increased absorption is due to the formation of oxy-chlorine compounds. The variation in the heat evolved during the solution of the same weight of chlorine in water are considerable, as it may range from + 1·50 to 3·77 cal., the first figure answering to a simple solution, and the second to a decomposition of the water by the chlorine. In concen-

trated hydrochloric acid chlorine dissolves much more plentifully than in water, and with a greater liberation of heat, facts which render probable the formation of a peculiar combination between chlorine and hydrochloric acid.

The Preparation of Chlorine. M. Berthelot. (*Comptes Rendus*, xci., 252-256, and *Journ. Chem. Soc.*, 1881, 22.) The author's experiments were undertaken to elucidate the first stage of the reaction which occurs in the preparation of chlorine by the action of hydrochloric acid on manganese dioxide. When these substances are mixed in the cold, a brown liquid is formed, which was supposed by Forchhammer to contain a sesquichloride of manganese, by Nicklès and by Fisher to contain manganese tetrachloride.

Action of Chlorine on Manganous Chloride.—A concentrated solution of manganous chloride, saturated with chlorine, and placed in contact with an atmosphere of this gas, dissolves only about half the quantity dissolved under the same circumstances by pure water, and about the same amount of heat is evolved in proportion to the chlorine dissolved in the two cases. The liquid slowly deposits a precipitate of manganese dioxide, absorbing at the same time an additional quantity of chlorine; but even after two months the ratio of chlorine absorbed to manganous chloride taken did not exceed 1 : 55. By diluting the original solution of manganous chloride saturated with chlorine with nine times its volume of water, an abundant precipitate of manganese dioxide is formed at once, which increases during a certain time. At the end of two months the liquid still contained manganous chloride and free chlorine, co-existing with the hydrochloric acid and manganese dioxide formed: there is, in fact, an equilibrium established.

Action of Hydrochloric Acid on Manganese Dioxide.—Manganese dioxide, mixed with a nearly equivalent quantity of a dilute (10 c.c. = 0.16 gram) solution of hydrochloric acid, evolves chlorine, and a brown liquid is formed; but the reaction is very incomplete. If the same mixture be heated in a sealed tube at 100° for twenty hours, the reaction proceeds further, but remains incomplete. After cooling, manganese dioxide slowly separates out on the side of the tube, proving that the equilibrium is dependent on the temperature.

Action of Chlorine on Manganous Chloride and Hydrochloric Acid.—On passing a current of chlorine into a concentrated solution of manganous chloride mixed with its own volume of strong hydrochloric acid, the liquid turns brown almost immediately, but deposits no precipitate even after three months. If the preceding solution be diluted ten times before saturating with chlorine, it

absorbs about the same quantity of that gas without any coloration or precipitate being at first produced; but after some weeks a small quantity of manganese dioxide separates out on the sides of the flask. The heat evolved during the absorption of chlorine by manganous chloride in presence of hydrochloric acid is several times as great as that evolved in the absence of hydrochloric acid.

The author concludes from these experiments that the brown colour is due to the formation of a compound perchloride, which may be considered as $\text{H Cl. Cl}_2 + n \text{ Mn Cl}_2$, or as $n \text{ H Cl} + \text{Mn Cl}_4$. On the first view, this perchloride is derived from the perchloride of hydrogen, H Cl. Cl_2 , described by the author in a previous paper. This compound dissociates under the influence of heat, and the dissociation is rendered complete when the chlorine is removed as fast as it is liberated. When the experiment is conducted in sealed tubes, re-absorption of the chlorine takes place on cooling, attended with separation of manganese dioxide. The influence of dilution is twofold; in the first place the manganous chloride is partly decomposed by the water into oxide and free acid, and the oxide is peroxidized by the combined action of the free chlorine and water; in the second place, absorption of energy takes place by the formation of definite hydrates of hydrochloric acid, and in consequence of this loss of energy, the manganous chloride may be partly transformed into dioxide, even in presence of hydrochloric acid, the equation, Mn Cl_2 (dilute) + $2 \text{ H}_2 \text{ O} + \text{Cl}_2$ (gas) = $\text{Mn O}_2 + 4 \text{ H Cl}$ (dilute), corresponding with a disengagement of 3.7 thermal units. This reaction is never complete, on account of the secondary formation of $\text{H Cl}_3 + n \text{ Mn Cl}_2$.

The equation, $\text{Mn O}_2 + 4 \text{ H Cl} = \text{Mn Cl}_2$ (anhydrous) + 2 Cl (gas) + $2 \text{ H}_2 \text{ O}$ (gas), corresponds with a disengagement of 12.9 thermal units, and this takes place to a greater or less extent in concentrated solutions, in which a portion of the hydrochloric acid is not combined with the water as a stable hydrate, the heat of formation of which is from 10 to 12 thermal units.

Estimation of Nitrates in Water Analysis by means of a Copper-Zinc Couple. M. W. Williams. (*Pharm. Journ.*, from a paper read before the Chemical Society, Feb. 3, 1881.) The estimation is conducted as follows:—Some strips of zinc foil are placed in a wide-mouthed stoppered bottle, and covered with a three per cent. copper sulphate solution. When the zinc has acquired a sufficient coating of copper, the solution is poured off and the copper-zinc couple washed with distilled water, and finally with the water to be analysed. The couple is again drained and the bottle then filled

with the water, stoppered, and placed in a warm (24°C.) situation, until the reduction of the nitrates is completed. The clear fluid is then withdrawn, and titrated directly by the Nessler method; about 1 square decimetre of zinc should be used with every 200 c.c. of water containing five parts of NH_3 in 100000. By saturating the water previously with CO_2 , or by adding a little pure sodium chloride to the water, the reaction can be expedited so that it is completed in a few hours. The nitrates are apparently first converted into nitrites, and the nitrites into ammonia. As soon as the water contains no nitrites, the conversion of the nitrates into ammonia is complete; in order to ascertain when this is the case, the author employs metaphenylene diamine, which in acid solution gives an intense yellow colour with nitrous acid. To calcareous waters, which give a turbidity when the Nessler reagent is added, the author adds a fragment of pure oxalic acid, allows the oxalate to settle, and titrates the clear liquid. The author has investigated the effects of temperature, and the addition of various substances on the rapidity of the above reaction. At low temperatures, the formation of ammonia is much retarded. The presence of alkalis, sodium hydrate, calcium hydrate, etc., retard, whilst carbonic acid, sodium chloride, etc., accelerate the reaction. The author also gives tables showing the amounts of nitrous acid and ammonia formed at different intervals after the commencement of the experiments. In conclusion, the author stated that he had applied the reaction so as to shorten the well-known process of Frankland and Armstrong considerably, and had been able to avoid the addition of sulphurous acid in the process; he hoped to publish these results shortly.

The Appearance of Nitrous Acid during the Evaporation of Water. R. Warington. (*Pharm. Journ.* From a paper read before the Chemical Society, March 17, 1881.) Schönbein stated some time ago that whenever pure water or an alkaline solution is evaporated ammonium nitrate is produced, and that the same salt is formed during ordinary combustion in the air. It has been, however, since shown by Wright, Carius, etc., that this occurrence of nitrites is due to impurities in the materials used or in the atmosphere in which the experiments were conducted. The fact, however, still remains that pure water evaporated to a small bulk under ordinary conditions will generally contain nitrous acid. The author has endeavoured to determine the conditions under which this occurs. He finds that pure water when evaporated over a gas or even a spirit flame always contains nitrites, one litre of water in

four hours contained 0.05 mm. of N, but that by using steam this quantity is diminished to one-twelfth, and by evaporating the water in a retort the introduction of nitrites could be altogether avoided. He proves also that distilled water when exposed to the ordinary atmosphere of a room in an evaporating dish absorbs in a few hours sufficient nitrous acid to be detected. Less nitrous acid is obtained when the water is exposed in the country; thus, after twenty-seven days' exposure in fields, water contained nitrous acid equal to 1 part of nitrogen in 15,000,000 of water. In conclusion, the author gave some account of the marvellously delicate test proposed by Griess, which far surpasses the delicate metaphenyldiamine test. The latter can detect only 1 part of nitrogen as nitrous acid in 10,000,000 of water, the former gives a distinct reaction with 1 part in 1,000,000,000. The test is described in *Ber. der deutsch. chem. Ges.*, 1879, p. 427. The solution to be tested is acidified with hydrochloric acid, a few drops of sulphanilic acid, and a few drops of an aqueous solution of hydrochlorate of naphthylamine added; if nitrous acid is present a rose colour is developed; in strong solutions a dark red precipitate falls. The author exhibited the delicacy of this test, and the absorption of nitrous acid from the atmosphere of the meeting room, by a dish of water which had been exposed since six in the evening. The water immediately turned rose-red on the addition of the solutions.

Determination of the Free Oxygen Dissolved in Water. J. Koenig and C. Krauch. (*Chem. News*, xlii., 218.) The authors, after referring to the researches of F. Tiemann and C. Preusse (*Ber. der deutsch. chem. Ges.*, 1879, p. 1768, and *Year-Book of Pharmacy*, 1880, p. 104), whose results they have not been able to confirm, enter upon an examination of the methods of Bunsen, of Mohr, and of Schützenberger and Risler. Their experiments led to the following conclusions:—Reichardt's apparatus is not suitable for a quantitative determination of the gases in liquids. The circumstance that even when the access of air from without is cut off, more air is still found than agrees with Bunsen's co-efficient of absorption, and that a determination of the proportion of air dissolved in water effected with the apparatus of Jacobson and Behrens yields more air, seems to point out that the absorption co-efficients of air for water, as calculated by Bunsen, are not valid under all conditions.

Mohr's method of determining oxygen in water yields invariably too high results—a conclusion exactly opposite to the one of Tiemann and Preusse. On what this difference depends the authors are

not able to explain. If, however, Mohr's method is always exactly followed, it yields numbers which are relatively accurate, or, in other words, which are comparable among themselves. Waters which have been exposed to direct sunshine or to daylight, yield more oxygen by Mohr's method, as compared with the other two methods, than the water of deep wells which has been for a considerable time excluded from sunlight.

Schützenberger's method yields results which fall below the truth. For absolutely accurate determinations of the oxygen in water, neither Mohr's method nor that of Schützenberger is suitable, the results of the former being too high, and those of the latter too low. When merely relative accuracy is required—as, e.g., in the examination of well waters—both methods may be used with equally good results. Mohr's method is suitable when single determinations have to be made at regular intervals, because the standard solutions required are more permanent and can be kept for a considerable time without change. Schützenberger's method is suitable when a great number of determinations of oxygen have to be made in succession in a very short time. The value of the sodium hydrosulphite solution should be determined for this purpose, not by means of a copper or iron solution, but by means of water containing a known quantity of dissolved oxygen.

A Simple Means for Increasing Certainty of Perception of Colour Change in various Titrations. Dr. A. Dupré. (*Analyst*, July, 1880.) In the titration of chlorides by silver nitrate in the presence of potassium chromate, the first colour change indicating the end of the reaction is somewhat difficult to perceive whenever the extreme weakness of the chloride solution necessitates the use of a likewise very dilute silver solution, as is the case in the estimation of chlorides in potable waters. In the latter cases it often becomes necessary to concentrate the water by evaporation previous to titration. The adoption of the following simple plan, however, renders this unnecessary, and enables the operator to perceive the change of colour with greatly increased precision.

100 c.c. of the water are placed in a white porcelain dish, and mixed with a moderate amount of neutral chromate (sufficient to impart a marked yellow colour to the water); but instead of looking at the water directly, a flat glass cell containing some of the neutral chromate solution is interposed between the eye and the dish. The effect of this is to neutralize the yellow tint of the water, or, in other words, if the concentration of the solution in the cell is even moderately fairly adjusted to the depth of tint

imparted to the water, the appearance of the latter, looked at through the cell, is the same as if the dish were filled with pure water. If now the standard silver solution is run in,—the operator still looking through the cell,—the first faint appearance of a red coloration becomes strikingly manifest, and when once the correct point has been reached, the eye is never left in doubt, however long the mixture may be observed.

A similar plan is suggested as useful in other titrations. Thus, in the case of turmeric, the change from yellow to brown is perceived more sharply and with greater certainty when looking through a flat cell containing tincture of turmeric of suitable concentration, than with the naked eye. The liquid to be titrated should, as in the former case, be placed into a white porcelain dish. Again, in estimating the amount of carbonate of lime in a water by means of decinormal sulphuric acid and cochineal, the exact point of neutrality can be more sharply fixed by looking through a cell filled with cochineal solution. In this case the following plan was found to answer best. The water to be tested—about 250 c.c.—is placed in a flat porcelain evaporating dish, part of which is covered over with a white porcelain plate. The water is now tinted with cochineal as usual, and the sulphuric acid run in, the operator looking at the dish through the cell containing the neutral cochineal solution. At first the tint of the water and the tint in which the porcelain is seen are widely different; as, however, the carbonate becomes gradually neutralized, the two tints approach each other more and more, and when neutrality is reached they appear identical; assuming that the strength of the cochineal solution in the cell, and the amount of this solution added to the water, have been fairly well matched. In the cell employed the two glasses are a little less than half an inch apart.

Preparation of Pure Hydrochloric Acid. L. L. de Koninck. (*Zeitschr. für analyt. Chem.*, 1880, 467.) The author finds ammonium chloride to be preferable to sodium chloride for the preparation of this acid, the action of the hot sulphuric acid on the former being more steady and regular than its action upon the latter. Another advantage consists in the non-crystalline and syrupy nature of the residual ammonium sulphate.

Etherification of Hydrobromic Acid. A. Villiers. (*Comptes Rendus*, xc., 1488–1491, and *Journ. Chem. Soc.*, Feb., 1881.) The extent to which hydrobromic acid, when treated with absolute alcohol and a mixture of alcohol and water, undergoes etherification, varies greatly with the temperature. Absolute alcohol, with

different proportions of hydrobromic acid, and heated at different temperatures, gives the following results:—

| Percentage of Acid etherified. | | | |
|---|------|---|------|
| $\frac{1}{2}$ H Br + C ₂ H ₅ O. $\frac{1}{2}$ H Br + C ₂ H ₅ O. | | | |
| At ordinary temperature, limit | | | |
| 658 days | 68.0 | . | 52.5 |
| At 44° C. temperature, limit 658 | | | |
| days | 79.6 | . | 59.9 |
| At 100° C. temperature, limit | | | |
| 658 days | 88.7 | . | 80.0 |

The percentage of acid converted into ether is not so great as that of the carbon acids; moreover, it is not fixed, but increases with the temperature.

These results show that combinations of alcohol with hydrobromic acid are formed analogous to hydrates.

The presence of water decreases the extent of etherification, and in large quantity prevents any action from taking place; the quantity of water required to prevent the action increases with the temperature. This is probably due to the formation of hydrates of hydrobromic acid, and the dissociation of these hydrates as the temperature is raised.

Ammonia as an Impurity in Sulphuric Acid. W. Gintl. (*Zeitschr. für analyt. Chem.*, 1880, 478.) The author calls attention to the occasional occurrence of ammonia in sulphuric acid. In one sample of acid sold as pure, the ammonia amounted to as much as five per cent.

Purification of Sulphuric Acid. F. Selmi. (*Gazz. Chim. Ital.*, x., 40, and *Zeitschr. für analyt. Chem.*, 1880, 478.) According to the author's experience, it is impossible to effect a complete removal of arsenic from sulphuric acid by treatment with sulphuretted hydrogen, unless the acid purified by means of this gas is subsequently mixed with half a volume of water and distilled with an addition of lead chloride.

Crystallized Hydrofluosilicic Acid. M. Kessler. (*Comptes Rendus*, xc., 1285.) When silicon tetrafluoride is passed through concentrated hydrofluoric acid, needle-shaped crystals of hydrofluosilicic acid are obtained, which correspond to the formula $\text{H}_2\text{SiF}_4 + 2\text{H}_2\text{O}$. The crystals are colourless, hard, and very deliquescent. They fume strongly in the air, fuse at about 19° C., and suffer decomposition when heated beyond this point.

Preparation of Pure Phosphoric Acid. A. Ditte. (*Comptes Rendus*, xc., 1163.) Pure phosphoric acid may be readily obtained

by saturating a solution of sodium phosphate with hydrochloric acid gas, decanting the clear liquid from the precipitated common salt, and distilling off the excess of hydrochloric acid.

Estimation of Traces of Phosphoric Acid in Potable Waters. O. Hehner. (*Analyst*, v., 135.) One litre of the water is acidulated with nitric acid, and evaporated to dryness in order to remove the silica. The residue is treated with a little nitric acid, the solution passed through a small filter, the filtrate evaporated to a few drops, and then precipitated by nitric acid solution of ammonium molybdate. The precipitate, after being washed with a small quantity of water, is dissolved in dilute ammonia, the solution evaporated, and the dry residue weighed. Its weight divided by 28.5 represents the amount of phosphoric acid present.

Volumetric Determination of Phosphoric Acid in Crude Phosphates and Superphosphates by Means of Uranium in Presence of Ferric Oxide. C. Mohr. (*Chem. News*; from *Zeitschr. für analyt. Chem.*, 1880, Part 2.) The author proposes the following process:—2 or 5 grams of the finely-powdered mineral are repeatedly boiled with small quantities of dilute nitric acid; the liquids are mixed in a measuring flask containing 100 to 250 c.c., and when cold filled up to the mark. In the case of superphosphate similar proportions are observed, but distilled water is used instead of nitric acid. 10 or 25 c.c. of the filtrate are mixed with a solution of sodium acetate till a permanent turbidity is produced. The solution of uranium acetate is then allowed to flow in, heating gently at first, and afterwards to a boil, and before the precipitation is at an end, a few granules of potassium ferrocyanide are added. The ferric phosphate is decomposed, the phosphoric acid enters into solution, the ferric oxide becomes Prussian blue and mixes with the uranium phosphate. The complete transformation of the ferric oxide into Prussian blue is ascertained when a drop of the clear liquid upon a porcelain plate shows no further coloration with ferro-cyanide. The hot liquid very rapidly deposits the suspended precipitate. The author presses the rounded end of a moist thin glass rod upon ferrocyanide in a dry powder, when so much clings to the glass as to be sufficient for 10 c.c. of a mineral containing a slight amount of iron. It is important to defer the further addition of the uranium solution till all the ferric oxide is transformed. The addition of the uranium solution is then continued till the known coloration with potassium ferrocyanide indicates the end of the process. The first drop of uranium solution should not occasion a red coloration where it

falls. If this happens, a new portion must be taken, and the operation repeated. As in the ordinary process of titrating phosphoric acid with uranium, the solution is rarely absolutely free from iron, the final reaction disappears after it has been already produced—a circumstance which often leaves the analyst in doubt as to the extent of a whole c.c. This disappearance of the final reaction may be avoided by the careful application of the method described above.

Metaphosphoric Acid as a Test for Albumen. Dr. W. C. Grigg. (From *Brit. Med. Journ.*) The author has made a series of comparative tests of urine, for the presence of albumen, with nitric and metaphosphoric acids, and considers the latter, for clinical purposes, to be far more delicate. In using it the solution should be fresh, and no heat should be used to dissolve it, as it is very unstable. He puts a piece of the acid, about the size of a pea, into a drachm of distilled water. The urine can either be added to the solution or the latter to it. If there be a trace of albumen, the urine will immediately become turbid and of a milky white colour.

Presence of some of the Rarer Metals in Urine. C. Schiapparelli and G. Peroni. (*Gazz. Chim. Ital.*, x., 390.) The authors' examination of the ash from 600 litres of urine revealed the presence of rubidium, calcium, lithium, cerium, lanthanum, didymium, and manganese.

Morphine in Urine. A. Bornträger. (*Archiv der Pharm.* [3], *ix*, 119.) After subcutaneous injections of morphine, the urine gives distinct indications of this base. The author, however, could not detect it in the urine of persons taking it internally.

Estimation of Urea in Urine. C. Benson. (*Journ. de Pharm. d'Anvers*, December, 1880.) The author describes a new form of apparatus for the estimation of urea by means of sodium hypobromide. Into a long, straight glass cylinder, a plain burette, divided into 50 c.c. and without a stop-cock, is introduced, and its upper end connected with a rubber tube, provided with a pinch-cock. This tube is intended to be attached to a glass tube projecting from the flask in which the reaction takes place. When using the apparatus, the cylinder is nearly filled with water, and by gently releasing the pinch-cock, and by suction through the open end of the rubber tube, the water is caused to rise in the burette until it stands on a level with the 0 mark. The pinch-cock is then closed and the tube connected with the flask, which has previously been charged with a solution of hypobromite and a

rubber tube containing a measured volume (5 c.c. or 10 c.c.) of the urine to be tested. The hypobromite solution is made by dissolving 65 grams of caustic soda in 1,000 grams of water, and adding gradually 60 grams of bromine. When everything is ready the pinch-cock is first released, whereupon the column of water in the burette will slightly fall below the 0 mark. The author directs that this diminution, provided it remain constant, should not be taken into account, but that after the reaction has ceased, the volume of gas should be read off, beginning from the 0 mark. The reaction is brought about by the upsetting of the rubber tube containing the urea solution, whereby the urea is decomposed with the evolution of nitrogen. When reading off the number of c.c. on the burette, the latter is to be lifted up until the water outside is on a level with that inside. The percentage of urea is calculated in the usual manner, but the author directs that 4.5 per cent. be deducted from the result, as a correction for products of decomposition which accompany the nitrogen.

The description of the apparatus is illustrated by a woodcut.

Quantitative Estimation of Urea. E. Pflüger. (*Pflüger's Archiv*, xxi., 248-286, and *Journ. Chem. Soc.*, 1880, 681.) In this paper the author, after discussing various objections which have been made to Liebig's method, states that he has found a possibility of error to the extent of 14 per cent., but believes that the method yields good results if Liebig's directions, with certain modifications, are carefully carried out. He first describes a method of preparing a pure urea from the commercial article, and also a method of preparing a pure mercuric nitrate solution. He then gives a number of experiments demonstrating the accuracy of his solutions, and shows that the manner in which the neutralization is carried out affects the result very materially. For neutralization, he uses a soda solution, and remarks that when baryta water is used for neutralization more mercury solution is required to give the colour reaction than with soda.

If the mercury and soda solutions are run into the urea solution alternately and in small quantities at a time, the reaction is reached too soon, e.g., at 17.2 to 17.3 c.c., instead of 20 c.c.

If the whole quantity of mercury solution required be added as nearly as possible at once, very accurate results are obtained. The time allowed to elapse between the adding of the mercury solution and neutralization is also important; if too long, the reaction comes too early. Experiments are given, tending to show that mercuric nitrate forms more than one compound with urea.

The author then describes his own method of carrying out Liebig's process. The solutions required are the usual mercury solution and a soda solution of known strength, the quantity of which required to neutralize a known volume of mercury solution has been accurately ascertained.

For testing he uses a plate of colourless glass placed on black cloth; the mercury solution is then added to the solution of urea, and the sodium carbonate test applied to a drop of the mixture on the glass plate, the drops being stirred each time until the yellow colour, which at first disappears on this treatment, becomes permanent.

The experiment is then to be repeated, the mercury solution being run in quickly up to the point indicated by the trial experiment, neutralized at once with the standard sodium solution, and tested as before.

The author's correction for concentration differs somewhat from that given by Liebig. His rule is: given the volume of urea solution + the volume of soda solution necessary for neutralization + the volume of any other fluid free from urea which was added, and call this V ; call the volume of mercury solution used V_2 , then the correction C is:

$$C = - (V_1 - V_2) \times 0.08.$$

Examples are given for solutions of urea of 1 per cent., 0.5 per cent., 0.33 per cent., 0.25 per cent., showing that this formula will hold so long as the mixture is less than three times the volume of mercury solution used.

Experiments are given on strong solutions with the same result. The necessity of adding nearly all the mercury solution at once is again dwelt upon, elaborate directions are then given for preparing the mercury and soda solutions (sodium carbonate of 1.053 sp. gr. is recommended); and in conclusion, the author states that if the sulphates, phosphates, and chlorides be removed, and the precautions stated are used, the method gives excellent results with urine.

Diastase. J. Kjeldahl. (*Dingl. polyt. Journ.*, ccxxv., 379-387, and 452-460, and *Journ. Chem. Soc.*, 1880, 562.) This research comprises a considerable amount of experimental work, undertaken by the author with a view of solving several questions which have arisen as to the active fermenting principle of malt, known as diastase. A normal solution of malt-extract was prepared. As to the influence which diastase is said to exercise on the production

of sugar, the author in his investigations arrived at the following law: the proportion of the amount of diastase of two malt-extracts may be expressed by the reducing power which they effect, providing that both act on the same quantity of starch, at the same temperature, during the same period of time. With regard to the influence of temperature on the yield of sugar, a series of trials was made, showing that at temperatures above 63° C. the fermenting power is weakened, whilst below 63° it does not appear to be affected. It was further proved that by long-continued digestion the same yield can be obtained at all temperatures below 63° as that obtained at 63° , and that the action of diastase at all these temperatures is the same, inasmuch as the yield of sugar may reach the same proportions in each of these cases.

Other questions of minor importance are considered in the original paper, such as the fermenting power of barley, the formation of diastase during the preparation of malt, the diminution of the fermenting power during the process of baking, the influence of the concentration on the production of sugar, the influence of foreign ingredients on the yield of sugar, viz., sugar, dilute acids and alkalies, salts of the heavy metals, other salts, alkaloids, alcohol, etc.

In conclusion, the author briefly refers to a substance called ptyalin, the diastase of saliva, which resembles the diastase of malt in several of its properties.

Papain. A. Wurtz. (*Comptes Rendus*, xc., 1379; *Pharm. Journ.*, 3rd series, xi., 129, 130.) In a former paper the author described, in conjunction with Dr. Buchut, a ferment which they had prepared by precipitating with alcohol the aqueous portion of the milky juice of *Carica papaya* after the formation of a coagulum, and to which they gave the name of "papain." It was at the same time stated as probable that a fresh quantity of papain was formed by the action of water upon the coagulum. This supposition is confirmed by his recent experiments, which clearly prove that the pulp, after being freed by washing from soluble ferment that may be adherent to it, still yields, by the action of water, a ferment capable of digesting fibrin. In connection with this subject he recalls the fact that the gastric ferment appears to be contained in an insoluble form in the pepsiniferous glands; for these do not yield it to pure water.

The analyses quoted by the author show that the product obtained by precipitation with alcohol, as stated above, is not of constant composition; and that even after purification by dialysis,

it is not a definite and homogeneous principle. Another mode of purification was therefore adopted. Albumen and peptones being precipitated by subacetate of lead, it was hoped to separate then by this reagent, which precipitates crude papain incompletely. To such a solution, therefore, subacetate of lead was carefully added until a portion after filtration no longer gave a precipitate. The precipitate was separated and a current of sulphuretted hydrogen passed into the filtrate. This was blackened, but the lead sulphide was not precipitated in flocks. To separate it the liquid was concentrated in a vacuum, and alcohol added to it drop by drop, so as to carry down the lead sulphide with the first portions of papain precipitated. The deposit having been separated by filtration, the clear liquid yielded to alcohol a white precipitate of papain. Two experiments made upon crude papain from different sources yielded specimens of purified papain, which, after exhaustion with ether and drying at 75° C. in a vacuum, gave, deduction being made for ash,—

| | I. | II. | III. |
|----------------|-------|-------|-------|
| Carbon . . . | 52.86 | 52.19 | 52.9 |
| Hydrogen . . . | 7.87 | 7.12 | — |
| Nitrogen . . . | 16.94 | 16.40 | 16.44 |
| Ash | 2.60 | 4.22 | 3.40 |

The sulphur was not estimated, sulphuretted hydrogen having been used during the operation. A third specimen contained 1 per cent. less of carbon; when submitted to dialysis during twenty-four hours it gave the figures stated under III.

0.1 gram of the specimen III. digested energetically 5 grams of moist fibrin, even after having been heated to 105° C.

The author considers that the preceding analyses demonstrate that the digestive ferment of *Carica papaya*, named "papain" by himself and Dr. Buchut, possesses the composition of an albuminoid substance. To the characters previously attributed to this substance he adds the following, which relate to papain purified by subacetate of lead.

It is very soluble in water, in which it is capable of dissolving in less than its own weight, after the manner of a gum. The solution, even when dilute, forms upon agitation an abundant froth. The crude papain redissolved leaves sometimes an insoluble white residue.

Solution of papain becomes turbid on boiling, without coagulating like albumen. When left to itself during several days it also

becomes turbid, and if then examined under a microscope, is found to be full of vibriones and bacilla.

It gives an abundant precipitate with hydrochloric acid, and the precipitate dissolves readily in excess of the acid.

Nitric acid, added in small quantity, precipitates thick yellowish flocks that dissolve in excess of the acid.

Neither ordinary phosphoric nor acetic acid precipitate it, but metaphosphoric acid gives a plentiful precipitate.

Potassium ferrocyanide added to acetic acid gives a precipitate.

Mercuric chloride does not immediately precipitate the solution of pure papain, or only gives a slight turbidity; after a time the turbidity becomes more apparent. Upon boiling an abundant flocculent precipitate is formed.

Lead subacetate does not give a precipitate, or only causes a slight turbidity, soluble in an excess of the reagent. If excess of potash be added to the liquor, and heat applied, it becomes blackened, in consequence of the formation of sulphide of lead.

Copper sulphate gives a violet precipitate, which becomes blue on boiling, and dissolves in potash with a beautiful blue colour.

Platinum perchloride gives an abundant precipitate, as also does tannic acid.

Picric acid gives an abundant precipitate insoluble in excess of the reagent.

Millon's reagent gives a plentiful yellowish white precipitate that becomes brick-red when slightly heated.

These characters, as will be seen, are those of albuminoid matters, with some variations, especially in respect to mercuric chloride and subacetate of lead.

In its action upon albuminoid matters, papain approaches the pancreatic ferment named "trypsin" by M. Kühne, who has made a careful study of it. Unlike pepsin, trypsin appears to approach the albuminoid matters; its action upon the latter appears to be more energetic than that of papain. Papain dissolves large quantities of fibrin rapidly, even in a neutral liquid; but to get a liquor that will not give a precipitate with nitric acid it is necessary to use a relatively large quantity of papain—for example, 0.3 gram for 10 grams of moist fibrin,—and to prolong the digestion at 50° C. during twenty-four hours. In this case there remains only an insignificant residue of dyspeptone, very rich in mineral matters; and the filtered solution gives with nitric acid only a slight turbidity, that may be due to an excess of the ferment. Moreover, in all these digestions, besides the bodies precipitated by nitric acid and by alcohol, there

is formed a certain quantity of more hydrated peptones, which are soluble in ordinary alcohol, especially with heat.

The rapidity with which solutions of papain become filled with microbes induced the author to ascertain whether they intervene in the rapid liquefaction of fibrin by this ferment, but he finds that nothing of the kind occurs.

The solution of fibrin by papain takes place in the presence of prussic acid, boric acid, and even carbolic acid ; that is to say, under conditions which exclude the formation of microbes.

In conclusion, the author adds that he has separated from the juice of *Carica papaya* a fatty, saponifiable substance and a crystallizable, nitrogenous principle in white mamelons. These remain in solution in the liquor from which crude papaine has been precipitated. Further information on this subject is promised.

Papaine : a Further Contribution to the History of Soluble Ferments. A. Wurtz. (*Journ. de Pharm. et de Chim.*, January, 1881.) In this additional paper on the soluble ferment of *Carica papaya*, the author shows that this substance is capable, under suitable conditions, of dissolving 2,000 times its weight of fibrin ; and further, that by long-continued digestion with water at 50° C., the ferment acts upon itself, causing its own hydration. Owing to this hydration, the composition of papaine is so modified as to cause a decrease of 2 per cent. of carbon.

The paper also contains an account of some experiments undertaken with the object of throwing light on the mode of action of this ferment. From these it appears that at the commencement of the action the papain fixes itself upon the fibrin, forming an insoluble product, which then, by the action of water, yields the soluble products of hydration of the fibrin, while the ferment thus liberated is ready to act upon a new portion of fibrin in the same manner as before. This continually renewed hydrating action is comparable, in some respects, to that of sulphuric acid in converting starch and dextrine into glucose.

Peptone. C. A. Pekelharing. (*Pflüger's Archiv*, xxii., 185-206. From *Journ. Chem. Soc.*) The researches of Plósz, Maly, and Adamkiewicz, the author admits, point to the conclusion that albuminoids, although changed by the digestive fluids into peptones, resume, after absorption, their original properties ; and further, that peptone may be substituted for albuminoids as a food, not only without harm, but with positive advantage to the animal. But it is obvious from the methods of preparation of peptone adopted by these observers, that the word "peptone" has not the clear and definite

meaning usually attributed to it. The method used in all these cases was the digestion of fibrin by gastric juice. But the times deemed sufficient by each observer for complete conversion vary widely: Plósz, two to three weeks; Maly, two to three days; Adamkiewicz, two to five hours. Despite these differences, the conclusions arrived at agree in the main, viz., that peptone can replace proteids as food, and that animals so fed will not only maintain, but increase their weight.

After examining these results more in detail, the author remarks on the importance of experimenting with a substance of constant composition, and proceeds to describe his method of preparing pure peptone, which depends on a property described by Place and Huizinga, viz., that in the cold a solution of peptone, having an acid reaction, is precipitated by neutral salts, the precipitate redissolving on warming.

Fibrin from bullock's blood and egg albumen was used, and was digested with 0.2 per cent. hydrochloric acid, and pepsin (either commercial or prepared by extracting pig's or dog's gastric mucous membrane in glycerol) for two to five hours at 40° C. The solution was then neutralized until the reaction was very feebly acid, heated to boiling, and filtered hot. The filtrate after cooling, usually opalescent or distinctly cloudy, was evaporated a little, made strongly acid with acetic acid, and saturated with sodium chloride. The somewhat abundant flocculent precipitate so produced was filtered off, after 8-12 hours. The fluid, which filters readily, passes perfectly clear through the paper, and the precipitate dissolves very readily in distilled water on warming, still not without a slight flocculent cloudiness, due to traces of albumen left unprecipitated on boiling the feebly acid liquid, but rendered insoluble by the subsequent precipitation with sodium chloride and acetic acid. If the precipitate is dissolved in a sufficiency of water, the fluid, when separated from the albuminoid precipitate, is perfectly clear; if, however, the distilled water be spared, with the idea of avoiding a large mass of fluid, the precipitate will return on cooling. The solution is then to be dialysed, in order to get rid of the acetic acid and sodium chloride; in one day a precipitate of peptone is formed, which continually increases as the dialysis is pushed, and which on warming, or the addition of small quantities of acid, alkali, or salts, is completely dissolved. After three or four days' dialysis the fluid is nearly free from salts, and the precipitate may be removed from the dialyser, boiled in water, and the resulting solution, which is not quite clear, filtered hot. The filtrate is a

pure peptone solution, and will yield a heavy precipitate on cooling. It is to be concentrated at a gentle heat, and finally dried in a vacuum over sulphuric acid. When dry, peptone so prepared is a pure white powder, and is not hygroscopic. It has the following properties :—

Heated over a flame, it does not melt, but forms strong tenacious bubbles. The ash is small; the substance heated at 105° gave 0.4 per cent. and 0.47 per cent. ash.

The powder is only partially soluble in cold water, but dissolves completely on warming, separating again as the solution cools. The solution has a perfectly neutral reaction.

Addition of a small quantity of sodium chloride will prevent precipitation on cooling; added in excess, however, it causes a slight turbidity in the cold, which disappears on warming.

Very small quantities of acids or alkalis will cause solution in the cold. Peptone is precipitated from the alkaline solution by sodium chloride in excess; this does not occur, however, if the peptone is warmed in the acid solution, provided the acid is not present in too small quantity, and has acted thoroughly (this is best effected by warming); saturation with sodium chloride to the extent of 4 per cent. gives a precipitate which completely disappears on heating. The same takes place if more salt is added. When 16 per cent. of salt has been exceeded, complete solution only occurs when the peptone solution is somewhat dilute. Peptone is precipitated from the feebly acid or alkaline solution by neutralization; if, however, too much acid or alkali has been used for solution, sufficient salt may be formed to hinder precipitation. Strong nitric acid gives a precipitate which vanishes on heating, before the yellow coloration appears, and returns on cooling. Silver nitrate added to a solution of peptone which is cooling, and therefore is becoming cloudy, increases the cloudiness. The precipitate disappears almost entirely on cooling; a slight opalescence, due to sodium chloride, alone remaining. The precipitate produced by silver nitrate is soluble in acetic acid.

Absolute alcohol precipitates peptone in neutral, but not in acid or alkaline solution. Potassium ferrocyanide and acetic acid give a voluminous precipitate, soluble on heating.

Basic lead acetate, with ammonia, tannic, and phosphomolybdic acids, give precipitates which are not soluble on heating.

The precipitate yielded by Millon's reagent dissolves with a red colour, if only small quantities of the mercury solution are used. More of the reagent gives a red precipitate, permanent on heating ;

cupric sulphate, ferric acetate, ferric sulphate, lead acetate, and basic lead acetate do not precipitate the peptone solution, unless sodium chloride or potassic acetate is present.

The author then proceeds to say that from these reactions no albumen can be present. Peptones from fibrin or albumen or other sources resemble one another in all their chemical properties. All are lævorotatory, but there is some difference in the degree of rotation,—albumen peptone having the least, and casein peptone the greatest, effect on polarised light.

No elementary analysis was made by the author. The question whether peptone is isomeric with albumen, or differs from it by one or more molecules of water, is then raised, and the experiments of Huizinga and others on the subject criticised at great length. With the view of showing that these observers did not use a pure material, Meissner's peptones were examined with results leading to the same conclusion.

Formation of Hypoxanthine from Albuminoids. E. Drechsel. (*Ber. der deutsch. chem. Ges.*, xiii., 240-242.) Salomon, Krause, and Chittenden are of opinion that the hypoxanthine observed in the solutions obtained from certain albuminoids by digestion, incipient putrefaction, or the action of dilute acids, does not exist as such in the albuminoids, but is a decomposition product. Thus Salomon could not detect it by ammoniacal silver nitrate in the aqueous extract, hot or cold, from well washed fibrin; and Chittenden did not observe it in the alcoholic extract, unless the alcohol had been boiled with the fibrin for twelve hours. The author does not regard these experiments as conclusive, for fibrin, as usually prepared, must necessarily include other blood constituents, which could only be removed with great difficulty; and, on the other hand, Salkowski has shown (*Pflüger's Archiv*, iv., 94), that the precipitation of hypoxanthine by ammoniacal silver nitrate does not take place in mixtures containing gelatin. The author has been unable by this reagent to detect purposely added hypoxanthine in the liquid obtained by heating fibrin with water in a digester. Again, there is no proof that the small quantity of hypoxanthine detected by Chittenden in the acid liquid obtained on boiling eggs with dilute acetic acid, and considered by him to exist as such in the egg, was not formed from the albumen during coagulation. The origin of hypoxanthine is therefore still uncertain.

Action of Tannin on Pepsin, Albumen and Albuminoids. Dr. L. Lewin. (*New Remedies*, October, 1880.) The well-known property of the tannin of nutgalls to precipitate dissolved albumen,

albuminoids, gelatin, etc., is of particular interest pharmacologically. These precipitates are insoluble in water, but soluble in moderately concentrated acetic acid, also in an excess of solution of albumen or gelatin (the resulting solution has a faintly acid reaction), in dilute lactic acid, and finally in carbonated and caustic alkalies. Tannin loses its property of coagulating gelatin and albumen after it has been mixed with an alkali to faint alkaline reaction. Such an alkaline tannate ceases to act perceptibly upon albumen, but still possesses the peculiar astringent taste characteristic of tannin, when put on the tongue.

Pepsin, as well as peptone, in solution in water behaves exactly like albumen. Previous observers have partly misinterpreted the action of tannin in the stomach, in presence of those bodies, because they failed to take account of the simultaneous presence of hydrochloric acid. For if tannin is added to a solution of pepsin, a precipitate is formed which only requires a little, say 0.1 per cent., hydrochloric acid to dissolve it. The same is the case with peptone. And if the solution of these bodies has been previously made acid, even by so small a quantity of hydrochloric acid as is normally present in the stomach, a precipitate is not produced at all.

Artificial digestion of fibrin or albumen by pepsin and hydrochloric acid, in presence of tannin, usually takes place entirely uninfluenced by the latter. Nor is the tannin at all changed. If it were, it would split up into gallic acid and sugar, but experiment proved that the quantity of sugar present after digestion was the same as was contained in the original sample of tannin employed. (Commercial tannin is hardly ever entirely free from sugar.)

The conclusions of the author are: that the artificial digestion of albumen remains unaffected by the presence of tannin; that the latter does not prevent the formation of peptone, and does not precipitate the pepsin; and that these facts are to be ascribed to the presence of free hydrochloric acid.

Bromo-Derivatives of Albuminoids. W. Knop. (*Bied. Centr.* 885.) By the action of bromine water in the cold on albumen, the author has obtained three compounds containing 3, 4, and 5 atoms of bromine in the place of the same number of hydrogen atoms respectively.

Formation of Sugar in the Liver. J. Seegen and F. Kratschmer. (*Pflüger's Archiv*, xxii., 214-239.) This paper contains an account of a series of experiments on dogs and rabbits. The results of which are summarised as follows:—

(1) In all the animals experimented on, the liver, when taken

out with all possible speed, was always found to contain from 0.5 to 0.6 per cent. of sugar.

(2) The liver-sugar is not entirely derived from glycogen, but has some other source.

(3) That not only the liver-sugar, but any carbohydrate which by heating with acids can be converted into sugar (glycogen or dextrin), can be formed afresh in the dead liver.

(4) The liver glycogen experiences a considerable diminution about forty-eight hours after death.

(5) An energetic transformation of glycogen, immediately after death, occurs only in rabbits.

Sugar of Milk. M. Schmöger. (*Ber. der deutsch. chem. Ges.*, xiii., 1915.) When a solution of sugar of milk is evaporated at 100° C., and the residue thoroughly dried at that temperature, the latter proves on analysis to be anhydrous milk sugar, and not, as is generally supposed, a combination with one molecule of water. The author also calls attention to the bearing of this fact on the interpretation of results in milk analyses.

Anhydrous Sugar of Milk. E. O. Erdmann. (*Ber. der deutsch. Chem. Ges.*, xiii., 2184.) Anhydrous milk sugar can exist in three different states, two of which are solid and crystalline, and one liquid. One of the solid modifications is obtained by rapidly boiling an ordinary solution of sugar of milk in a metal vessel; the solution after some time solidifies to a porous mass consisting of small anhydrous crystals, which have a low rotatory power which slowly increases, and are very soluble in water. The second solid modification is obtained by dehydrating ordinary sugar of milk at 130° C. It is much less soluble in water than the previous one, and possesses a high rotatory power which, however, gradually diminishes. The liquid modification is produced by the gradual transformation of the solutions of the two preceding forms on keeping. It is not liable to change in the dissolved state; but on attempting to crystallize it from the solution it passes into the ordinary hydrated sugar of milk, while on boiling it is converted into the solid form first mentioned.

Identity of Arabinose and Lactose. H. Kiliani. (*Ber. der deutsch. chem. Ges.*, xiii., 2,304.) Arabinose, the crystalline sugar obtained by Scheibler by the action of dilute sulphuric acid on gum arabic, is shown by the author to be identical with lactose, as it agrees with the latter in its rotatory power and in the nature of its decomposition products.

Preparation of Pure Levulose. C. H. Girard. (*Bull. de la*

Soc. Chim., xxxiii., 146.) A solution of cane sugar is acidified with hydrochloric acid, and heated to 60° C. until it contains about 12 per cent. of inverted sugar. It is then cooled to -5° C., mixed with slaked lime, the solidified mixture pressed, the pressed mass mixed with water and again pressed; and this process repeated until the press liquors cease to be dextro-rotatory. The lime is now removed by means of oxalic acid, and the resulting solution of levulose cooled by means of a freezing mixture to below 0° C. After separating the concentrated levulose solution from the ice crystals, it is dried in vacuo.

Solubility of Cane Sugar in Water. H. Courtonne. (*Ann. de Chim. et de Phys.* [5], xii., 569.) The author has recently determined the solubility of cane sugar in water, both at 12·5° and 45° C., and obtained the following results:—

| | | | | |
|-----|----------------------------|----------|---------|-----------------|
| 100 | grams of water at 12·5° C. | dissolve | 198·647 | grams of sugar. |
| 100 | " " " 45° C. | " | 245·0 | " " " |

A solution saturated at 12·5°, therefore, contains 66·5 per cent., and one saturated at 45° C., 71 per cent. of sugar.

Behaviour of Cane Sugar towards Silver Oxide. E. Salkowski. (*Zeitschr. für analyt. Chem.*, 1880, 485.) Cane sugar does not reduce solution of ammonio-nitrate of silver when heated with the latter, except in the presence of caustic soda or potash. As no inversion of the sugar takes place under the influence of the alkali, the author attributes the reducing action to decomposition products of the sugar formed by the action of the alkali. He intends to investigate these decomposition products.

Mannite and the glucosides show the same behaviour as cane sugar.

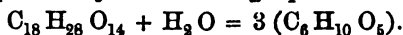
Action of Bromine on Cane Sugar. E. Reichardt. (*Bied. Centr.*, 1880, 559.) When bromine acts upon cane sugar, the latter splits up into gluconic acid, glucose, and gum.

Determination of Crystallizable Sugar in the Presence of Dextrin and Glucosides. H. Pellet. (*Comptes Rendus*, xci., 308.) The author states that acetic acid, if used in sufficient quantity, converts crystallizable sugar completely, though slowly, into inverted sugar, while it is without action on dextrin or glucosides.

The Alleged Synthesis of Glucose. L. Valente. (*Gazz. Chim. Ital.*, x., 540.) S. Zinno claims to have produced glucose by treating an aqueous solution of glycerin with potassium permanganate, precipitating the potash with tartaric acid, removing the excess of the latter with powdered marble, and evaporating. The

author has repeated Zinno's experiments, and finds that there is no glucose formed in this reaction. The observed action of the product on polarized light is found by him to be due, not to glucose, but to the small quantity of calcium tartrate which remains dissolved.

Conversion of Glucose into Dextrin. F. Musculus and A. Meyer. (*Bull. de la Soc. Chim.* [2], 368; and *Journ. Chem. Soc.*, 1881, 570.) On adding to 20 grams of glucose 30 grams of sulphuric acid, stirring the mixture constantly, heating to 60° C. until it becomes brown, and throwing it into 800 grams of absolute alcohol, there is formed, in about a week, a thick precipitate, consisting of a white hygroscopic powder of the composition $C_{18}H_{28}O_{14}$, C_2H_6O . On boiling with water, the alcohol is eliminated and water substituted. A yellow amorphous mass is thus obtained, having all the properties of dextrin. The formation of the latter is explained by the following equation:—



Occurrence of Vanillin in Raw Sugars. E. O. v. Lippmann. (*Ber. der deutsch. chem. Ges.*, xiii., 662.) The author confirms an observation recently made by Scheibler (*Ibid.*, 335), that certain kinds of raw sugar contain minute quantities of vanillin.

Commercial Glucose. Dr. Nessler. (From *Pharmaceut. Zeitung*.) When commercial glucose is fermented by means of yeast, there always remains, after the expulsion by heat of the alcohol from the filtered product, an unfermented portion, which in some instances amounts to as much as 25 per cent. This portion has a bitter taste and turns the plane of polarization to the right. The author mentions two cases in which the internal administration of this unfermentable body was followed by severe headache, cold perspiration, and other unpleasant symptoms. The question whether the substance pre-exists in commercial glucose, or whether it is formed during the fermentation is left unascertained.

New Formula for Fehling's Solution. M. Schreiter. (*Pharm. and Chem.*, 1880, 436.) As Fehling's solution, made according to the well-known formula, is so liable to decomposition, the author suggests the following as yielding a much more permanent preparation:—

| | |
|----------------------------|------------|
| Salicylate of Soda | 20 grains. |
| Sulphate of Copper | 20 " |
| Caustic Soda | 100 " |
| Distilled Water | 400 " |

After filtration a clear blue liquid is obtained, which keeps well, and is as delicate a test for sugar as the ordinary Fehling's solution.

Inulin. H. Kiliani. (*Journ. Chem. Soc.*, 1881, 243.) The author alludes to the discordant results of former researches on inulin, and to the necessity of a fresh study of its properties and chemical relations. In order to prepare it, roots of the *Dahlia variabilis* and *Inula helenium* were boiled with water in the presence of sodium carbonate. The liquid obtained was cooled by a freezing mixture, and the separated precipitate was dissolved in hot water, filtered, and again exposed to a freezing mixture. After repeating this process three or four times, the inulin is obtained perfectly white, and is subsequently purified from levulose by absolute alcohol, and finally dried over sulphuric acid.

Inulin obtained in this way is a white powder resembling starch; by slow evaporation of an aqueous solution it forms "crystal spheres," as observed by Sachs and Prantl (*Jahresb.*, 1870, 849). It is insoluble in absolute alcohol, sparingly soluble in dilute alcohol and cold water, but very soluble in hot water. The author has confirmed the formation of a gum-like and horny modification of inulin; the latter the author considers to be a highly hydrated inulin, which is converted into solid lumps of inulin in the same way that ferric hydrate and silicic acid are converted into their corresponding anhydrous oxides. Its sp. gr. is 1.3491, and its optical rotatory power, as determined with a Wild's polaristrometer, $[\alpha]^d = 34.6$ to 36.4 , gives results agreeing with those of Lescœur and Morelle (*Journ. Chem. Soc.*, 1878, 970). The author assigns to inulin the composition $C_{36}H_{62}O_{31}$ ($= 6C_6H_{10}O_5 + H_2O$). He has also confirmed the observations of others that inulin, when heated with water in sealed tubes at 100° , is converted into a sugar which resembles levulose in chemical and physical properties. When oxidized with dilute nitric acid, inulin yields formic, oxalic, racemic, glycollic, and probably glyoxylic acids. The author finds that glycollic and saccharic acids alone are formed when dextrin is oxidized with dilute nitric acid.

Inulin is slowly oxidized by long contact with bromine in sealed tubes, with formation of bromoform and carbonic and oxalic acids; the hydrobromic acid formed in the reaction converts the unchanged inulin into levulin. This latter, by the further action of bromine, gives the same products as inulin. By heating the brominated liquid with silver oxide, some of the unchanged levulose is converted into glycollic acid. As this acid is formed by the direct action of bromine and silver oxide, it is possible that the inulin is converted by the bromine into levulose, which is then oxidized by the silver oxide into glycollic acid. For comparison the author

has studied the action of bromine and silver oxide on dextrose, and finds that no oxalic, but only gluconic acid is formed, according to the equation $C_6H_{12}O_6 + O = C_6H_{12}O_7$. Glycollic acid is formed as a secondary product of the action of silver oxide on the gluconic acid. By distillation of inulin with hydriodic acid, a small quantity of an oil containing iodine is obtained, but its constitution could not be ascertained, as it readily decomposed. By the action of nascent hydrogen on inulin (sodium amalgam and water) neither mannitol nor mannitan is formed. Pure inulin reduces ammoniacal silver solution and gold chloride, but not Fehling's solution nor gold or platinic chloride.

When inulin is heated with baryta water it is partly converted into lactic acid. By inversion, inulin is not converted at ordinary temperatures nor at $40^\circ C$. into levulose (Barth, *Ber.* [11], 474; 1878, 591). It appears from these properties that inulin stands in near chemical relation to levulose, and is probably its anhydride. This is shown by the readiness with which it takes up water in many reactions, being converted into levulose. It, however, differs from levulose by not reducing Fehling's solution, and not undergoing fermentation with yeast, and not forming an additive compound with hydrogen. Levulose, the hydrate of inulin, differs from dextrose in its oxidation products with nitric acid and bromine water; the former gives glycollic and oxalic, the latter gluconic acid. This difference may be simply explained by supposing dextrose to be the aldehyde, whilst levulose is the ketone of mannitol.

Preparation of Glycollic Acid from Sugar. H. Kiliani. (*Liebig's Annalen*, ccv., 191.) Dextrose, levulose, and starch sugar, when oxidized by silver oxide, yield glycollic, oxalic, and carbonic acids. The greatest yield of glycollic acid is obtained at ordinary temperatures, and the least proportion at $100^\circ C$.

Gelose. H. Morin. (*Journ. Chem. Soc.*, 1881, 403.) This substance, which is remarkable for forming a jelly with 500 times its weight of water, was first studied by Payen (*Comptes Rendus*, 1859, 521). It has since been introduced into commerce in considerable quantities, under the name of China moss (*mousse de Chine*), and Ta-ô; it is used in making jellies, and for the preparation of certain stuffs.

It is oxidized by dilute nitric acid, with formation of mucic and oxalic acids. Dilute mineral acids, also acetic and oxalic acids, deprive it of its property of gelatinizing; water heated until at a pressure of 5-6 atmospheres has a similar effect.

The air-dried substance loses 22.85 per cent. of water at 100° , and leaves 3.88 per cent. of ash when burnt.

A 10 per cent. aqueous solution has a lævogyrate power for a yellow light of $-4^{\circ} 15'$; by the continued action of acidulated water this is converted into a nearly equal dextrorotatory power. This dextrogyrate solution reduces cupropotassic solution, and also mercuric chloride and auric chloride.

Alcohol precipitates the lævogyrate solution, but the precipitate contains a larger proportion of ash than the original substance.

All these properties seem to ally gelose with the gums.

Gelose. M. Porumbaru. (*Comptes Rendus*, xc., 1081.) The formula of pure gelose is $C_6H_{10}O_5$, analogous to the formulæ of lichenin, inulin, and tunisin.

The action of water on gelose at temperatures from 100 – 150° , gives rise first to one or more products reducing cupropotassic solution, and having a lævorotatory action, and finally to a brown ulmic substance. The lævorotatory substance has the formula $C_6H_{12}O_6 + H_2O$.

A one per cent. solution of sulphuric acid at 100° gives rise to another substance reducing cupropotassic solution, and crystallizing from alcohol in long needles. These results differ in several particulars from those obtained by Morin (see preceding abstract).

Volumetric Estimation of Glycerin. Dr. J. Muter. (*Analyst*, 1881, 41.) The process recommended in this paper is based on the power of glycerin to arrest the precipitation of cupric hydrate by alkalies. The *modus operandi* is as follows:—

Take one gram of absolute glycerin, and wash it into a long stoppered graduated tube, having a stopcock at 50 c.c. from the bottom. Now add 50 c.c. of a strong solution of potassium hydrate (1 in 2), and then a weak solution of cupric sulphate very gradually and with constant shaking, until a fair amount of cupric hydrate is produced which remains undissolved. Make the whole up to a given bulk, and then close the tube and set it aside to settle. When perfectly clear, run off from the tap into a beaker a given volume of the deep blue liquid, and add to it the slightest possible excess of nitric acid; then pour in a definite excess of ammonium hydrate, bring the beaker under the burette charged with volumetric solution of potassium cyanide, and run in till decolourized. The number of c.c. of potassium cyanide used, after calculating to the whole bulk originally in the tube, represents one gram of glycerin. The result has, however, to be corrected by going through the blank experiment with the same amounts of everything, but without

glycerin, and deducting the c.c. of cyanide taken from that before found: this is necessary, because cupric hydrate is not quite insoluble in the strong alkali used, but once made and deducted, the difference gives the true value in glycerin of the cyanide solution, and that once standardized, any number of samples can be quickly analysed. The author uses absolutely pure potassium cyanide, made from hydrocyanic acid.

So far the author has only applied his process to pure solutions of glycerin; but he intends to extend it to the estimation of glycerin in other substances, and, for this purpose, is engaged in the investigation of the methods for its isolation.

The Manufacture of Glycerin. (From *Chem. News*, June 24th, 1881.) In view of the present position of the article and the prospect of a continuance of high prices for a considerable time to come, the attention of soapmakers is now being turned to the utilization of their waste "leys," and various new processes for recovering the glycerin contained in these liquors have lately been tried with more or less successful results. Apart from minor impurities, waste soap "leys" are generally found to contain glycerin, carbonate of soda or caustic soda, chloride of sodium, gelatin, and albumen. One of the processes for recovering the glycerin which promises to be the most economical and the most successful, begins with concentrating the liquor until the salts contained therein begin to crystallize. The liquid is then cooled and filtered, to rid it of gelatin and albumen. It is afterwards made to absorb carbonic acid, which precipitates bicarbonate of soda, and this is separated from the liquor in the usual way. After undergoing this process the liquor is then made to absorb gaseous hydrochloric acid until what remains of carbonate of soda has been converted into chloride, and further, until all, or almost all, the chloride of sodium has been precipitated and separated from the liquor in the usual manner. Arrived at this stage, the liquor contains water, glycerin, and hydrochloric acid. The acid is then evaporated entirely and absorbed in water for using afresh. The dilute glycerin remaining can be purified by filtering it through animal charcoal or by concentrating and distilling.

Estimation of Glycerin in Beer. F. Clausnizer. (*Zeitschr. für Analyt. Chem.*, 1881, 58-82.) The author proposes the following mode of estimating glycerin in beer as the most trustworthy: 50 c.c. are evaporated in a dish with a glass rod previously tared; when the carbonic anhydride has escaped, about 3 grams of slaked lime are added, and the whole is evaporated to a syrup, about

10 grams of coarsely powdered marble are then stirred in, and the stirring occasionally repeated during the drying, until hard lumps remain. The dish is then re-weighed, its contents are rubbed to powder, and an aliquot part ($\frac{1}{3} - \frac{1}{2}$) subjected in the extracting apparatus for four to six hours to the action of 20 c.c. of 80-90 per cent. alcohol; the alcoholic extract is mixed with 25 c.c. of dry ether, and after standing an hour it is filtered into a small weighed flask, and the filtrate and precipitate are washed with alcohol-ether (2 : 3). The flask is placed in an oblique position on a gently heated water-bath, until the ether and alcohol are evaporated, and the residue is then dried in a lightly-covered flask at 100-110°, until not more than 2 mgrms. are lost in two hours; the drying occupies from two to six hours. If the ash is to be estimated, the glycerin is rinsed with water into a platinum dish, dried, and incinerated; the ash need rarely be estimated.

The quantity of glycerin (free from ash) usually found by the author in 100° c.c. of genuine beer ranged from 0.20 to 0.26 gram.

Detection of Picric Acid in Beer. Dr. H. Fleck. (*Correspondenzbl. des Ver. Anal. Chem.*, 1880, No. 11.) Half a litre of the beer is evaporated to a syrup, the residue mixed with ten times its volume of absolute alcohol, filtering, evaporating the filtrate to dryness, boiling the residue repeatedly with water, evaporating the united aqueous solutions, and extracting the residue with ether. On allowing the ether to evaporate, the picric acid is obtained in an almost pure condition.

Estimation of the Fat in Milk. Dr. F. Soxhlet. (*Chem. News*, xliii., 101.) The author describes a new method, which consists in the shaking of a definite quantity of the milk with ether and a little caustic alkali, and inferring the proportion of fat from the specific gravity of the ethereal fat solution as determined by a good hydrometer. Tables are given showing the amount of fat in weight per cent., corresponding to the specific gravity of the ethereal solution at 17.5° C.

A New Mode of Testing Coffee. F. M. Rimmington. (*Pharm. Journ.*, 3rd series, xi., 529.) Chicory and dandelion are readily deprived of their colour by a weak solution of chlorinated lime, while this agent has very little action on coffee. The coffee to be tested should be gently boiled a short time in water with a little carbonate of soda, so as to remove extractive matter as much as possible; after subsidence the liquor should be poured off, and the residue washed with distilled water. When this has been sufficiently done, a weak solution of chlorinated lime is added and

allowed to remain, with occasional stirring, until decoloration has taken place, which will be probably in two or three hours. The coffee will then form a dark stratum at the bottom of the glass, and the chicory a light and almost white stratum floating above it, and showing a clear and sharp line of separation.

The chicory after this operation is in the very best condition for microscopical examination, and it is not difficult to discriminate between chicory, dandelion, or other substances. Although the lower stratum may be dark, and have all the appearance of coffee, other substances may be present and should be sought for. The author has recently met with a substance entirely new to him as a coffee substitute, that is not affected by this treatment.

Detection of Ergot in Flour. (*Journ. de Pharm. et de Chim.*, Oct., 1880, and *Chem. News*, xliii., 117.) The suspected sample is treated with cold ether or boiling alcohol to dissolve the greater part of the colouring matters of the flour. The residue is then extracted with ether, mixed with a small quantity of sulphuric acid, and the extract examined with the spectroscope. The ethereal extract of ergot, if concentrated, absorbs all the refrangible portion of the spectrum beyond D; if the solution is diluted the spectrum is enlarged, and there appear three absorption bands: the first between D and E, wave-length, 538; the second between E and F, wave-length, 499; and the third between F and G, wave-length, 467. Hoffmann agitates the acid ethereal extract with a little solution of sodium bicarbonate, which seizes the colouring-matter of the ergot and takes a fine violet colour, whilst the colouring-matters of the flour remain in the ether.

Colouring Matter of Grapes and Bilberries, and the Artificial Colouring of Red Wines. A. Andrée. (*Archiv der Pharm.* [3], xvi., 90.) Red wines are supposed to be frequently artificially coloured with fermented bilberry juice, and various methods have been suggested for detecting this sophistication. The author's investigation, however, tends to show that the colouring matter of the bilberry is identical with the natural colouring matter of red wines, as the two completely agree in their properties and reactions.

Detection of Rosaniline in Wines. V. Wartha. (*Ber. der deutsch. chem. Ges.*, xiii., 657-662. From *Journ. Chem. Soc.*) In order to detect the presence of rosaniline compounds in red wine, the three following tests are recommended:—

1. 20 c.c. of the wine are mixed with an excess of magnesium oxide in a test-tube, and then a mixture of equal parts of colourless amyl alcohol and ether, gradually added with frequent

shaking. On standing, the supernatant liquid becomes rose-coloured, even if the wine contains only one mgrm. of rosaniline per litre. With strongly coloured southern wines containing only a small quantity of rosaniline, the colour is sometimes yellowish or a light brown.

2. 20 c.c. of the wine are shaken with 10 c.c. of lead acetate solution (official strength), and filtered into a dry test-tube. If a moderate quantity of rosaniline be present, the filtrate is rose-coloured; whereas if there is only a small quantity of aniline violet, the liquid is either colourless or only slightly yellow. In either case 1 c.c. of the above mixture of amyl alcohol and ether is added, the liquid shaken, and allowed to stand; the upper layer of liquid then becomes rose-coloured if rosaniline be present.

3. Evaporation is unnecessary if tests (1) and (2) have indicated the presence of a considerable quantity of the dye. If, however, this is not the case, 150–200 c.c. of the wine are quickly evaporated over a naked flame to one-fourth of their original bulk, and the *hot* liquid poured into a stoppered glass cylinder (previously cleansed with strong nitric acid and water), and excess of ammonia added, and the liquid carefully shaken with 30–40 c.c. of pure ether. The ethereal solution is then passed through a dry filter into a porcelain basin containing one or two threads (3–4 cm. long) of Berlin wool previously washed and dried; the ether is allowed to evaporate spontaneously in a warm place, when the wool becomes rose-coloured if rosaniline be present. This is further confirmed by dividing one of the threads into two parts, one of which is moistened with strong hydrochloric acid, and the other with strong ammonia, when the colour must be replaced in both cases by yellow if rosaniline, and by green, if aniline violet be present. By this means .01 mgrm. of rosaniline can be detected in 1 litre of wine.

The Recognition of Blood Stains. D. Vitali. (*Gazz. Chim. Ital.*, x., 213–225, and 261–264. From *Journ. Chem. Soc.*) The author points out that the blue colour produced when a mixture of turpentine and alcoholic solution of guaiacum is agitated with blood, is an effect of oxidation, and may readily be produced by many other substances, especially if copper or iron salts are present. It is necessary, therefore, to use this test with great caution: the suspected fluids should first be agitated with a small quantity of tincture of guaiacum and allowed to stand some hours, when it will remain colourless if no substance is present capable by itself of colouring the guaiacum. If, however, blood is present, a blue colour will be produced on adding turpentine to the mixture and

agitating. If the stains have dried, they should be dissolved off with a little dilute solution of potash free from nitrites, and the liquid neutralized with acetic acid previous to adding the tincture of guaiacum. The author has observed that the guaiacum when precipitated from its alcoholic solution by water in presence of hæmoglobin, carries down the whole of the latter, so that the test becomes one of extreme delicacy, the reaction being quite distinct with a solution containing one part of dried blood in one hundred millions, especially if it is gently heated. The precipitated resin, however, is in so fine a state of division that it is very difficult to collect it, and it is better to agitate with ether or amylic alcohol. With the former, the blue colour is produced at once in the cold, without the addition of turpentine; with the latter, heat must be applied. It was found that the colour reaction was obtained even with dilute blood which had been allowed to stand two months in an open vessel and had become putrid.

Chlorophyll. M. Pringshein. (*Comptes Rendus*, xc., 161-165.)

By exposing a portion of vegetable tissue under the microscope to bright sunlight concentrated by means of a large lens, the author has been able to follow by direct observation the effects of light on chlorophyll, and on the protoplasmic contents of the living cell. In this manner he has proved the existence in chlorophyll of a colourless, crystallizable, oleaginous substance, hitherto unknown, which appears to have a direct relation with the assimilation of carbon by the green parts of plants. This substance, named *hypochlorin*, has not been isolated in a pure condition, but it has been shown to be the only carbon compound, in phanerogams at least, which cannot be formed without the aid of light.

Researches on chlorophyll itself have fairly proved that this pigment is not decomposed in the act of carbon assimilation, and that it cannot be considered as the mother-substance of all or any of the carbon compounds found in plants.

It is true that its decomposition in the isolated cell can be directly observed, but this decomposition is due to the action of oxygen, and is quite independent of absorption of carbonic anhydride, or even of the presence of this gas.

The author's micro-photochemical researches on the green cell show that respiration or inspiration of oxygen increases in a corresponding ratio with the intensity of the light, and that this absorption may become so great as to be positively injurious to the plant; the energy of oxidation becomes then greater than the energy of assimilation, the hypochlorin disappears, and the other combustible

substances, which together make up the contents of the cell, are rapidly oxidised and destroyed. But the chlorophyll by its power of luminous absorption counterbalances these two functions: it acts as a protective screen, absorbing the chemical rays and diminishing respiration, thereby enabling the assimilation of carbon by the plant to keep pace with the oxidation of its carbon compounds.

When the particles of chlorophyll are examined carefully under the microscope, they are seen to be porous bodies, the solid portion of which, like a sponge, is impregnated throughout with an oil, in which the green pigment is dissolved, and which generally contains the crystallizable substance termed hypochlorin. Protected by the coloured pigment, the hypochlorin, which appears to be the mother-substance of the carbohydrates, does not undergo rapid combustion, but it either remains unaltered in the chlorophyll, or suffers a regulated oxidation, such as may be properly said to be one of the life functions of the plant; in concentrated solar light, however, the hypochlorin is instantly destroyed, before even the chlorophyll has had time to be attacked.

The protective action of the chlorophyll is the new point which the author considers he has satisfactorily demonstrated.

Crystallized Chlorophyll. M. Hoppe-Seyler. (*Bied. Centr.*, 1880, 375, 376; *Journ. Chem. Soc.*, 1880, 894.) Leaves of grass, after being treated with ether until the wax was completely removed, were boiled with alcohol, which dissolved two colouring matters; both of these crystallized out during cooling. The first is red in transmitted light, and is evidently identical with the substance to which Bongarel gives the name of erythrophyll. After this substance has been removed by filtration, the filtrate concentrated, and the residue washed repeatedly with water, dissolved in ether, and left to evaporate, crystals reappear on the sides and bottom of the vessel; they are granular, brown in transmitted, green in reflected light. These crystals may be purified by repeated washings in cold and solution in warm alcohol and in ether.

The author gives this substance the name of *chlorophyllan*; it has the consistence of soft wax; in a fairly dry condition it melts at 110°. The crystals are sparingly soluble in cold alcohol, but dissolve readily in ether or chloroform. The solution shows the fluorescence of alcoholic or ethereal extracts of green plants, and a similar but not precisely identical spectrum, which leads the author to the conclusion that chlorophyllan does not exist as such in the plant, but is formed during the treatment. The percentage composition is given as C, 73.4; H, 9.7; N, 5.62; O, 9.57; P, 1.37;

Mg, 0.34; the phosphorus and magnesium are not considered as impurities, but appear to be normal constituents of the substance. Further experiments are promised.

The Composition of Chlorophyll. M. Rogalsky. (*Comptes Rendus*, xc., 881.) The author's combustion of chlorophyll gave the following numbers:—

| | |
|--------------------|--------|
| Carbon | 78.015 |
| Hydrogen | 10.377 |
| Nitrogen | 4.140 |
| Oxygen | 10.811 |
| Ash | 1.657 |

The chlorophyll submitted to analysis was prepared by Fremieux's process from *Lolium perenne*.

Analysis of Soaps. J. Loewe. (*Zeitschrift für analyt. Chem.*; and *New Remedies*, Jan., 1881.) For the determination of moisture the author takes from 8 to 10 grams, shaved very finely, and dries them, first at 60–70°, afterwards at 100–105°. If it is supposed that the soap contains caustic alkali, the process must be conducted in an atmosphere free from carbonic acid. The free alkali may also be determined before the process of drying, by exposing a portion of soap, shaved very fine, and weighed upon a watch-glass, in a cylinder filled with dry carbonic acid, and closed, the proportion of caustic alkali being calculated from the increase of weight. The exposure must not last too long, in order to prevent the formation of bicarbonate.

To determine free unsaponified fat, the portion of dry soap is thrown into a rather high beaker capable of being well covered, and extracted with benzol or petroleum ether with the aid of heat, according to the method of Perutz, and decanting, when clear, into a small tared flask. If the decantation is difficult, it is passed through a weighed filter, which is afterwards used for the alcoholic solution of the soap. After two or three extractions the filtrates are collected and distilled, the residue dried at 108° in a chloride of sodium bath, and the increase of weight of the flask is noted, which shows the proportion of the non-saponified fat.

The residue freed from such fat is covered with about 8 to 10 parts of alcohol of 90 per cent., and heated to from 40–50° in the water-bath. Caustic alkali, and that in combination with fatty acids, along with glycerin, are readily dissolved, whilst soda (carbonate), farina, and mineral impurities remain undissolved, and after washing with hot alcohol and drying at 100°, may be weighed. In the better

class of soaps the residue does not exceed one to one and a half per cent.

A moderate stream of well-washed carbonic acid is then allowed to play upon the surface of the warm alcoholic filtrate. Caustic alkali, if present, is deposited as alkaline carbonate. The beaker is covered, allowed to stand till clear, heated in the water-bath, the contents filtered, and the filter is washed with warm alcohol. In the aqueous solution of the residue the carbonate of soda may be determined volumetrically.

The second alcoholic filtrate, thus freed from soda, is mixed with sulphuric acid diluted with alcohol as long as a turbidity is produced. When clear, the sulphate of soda deposited is filtered off, collected upon a weighed filter, washed with alcohol, dried at 110° , and weighed. The weight shows the alkali which was in combination with the fatty acids.

The filtrate is acidulated with sulphuric acid, mixed with water, and freed from alcohol by evaporation in a platinum capsule. When cold, the acid aqueous extract which may contain glycerin is separated from the congealed fatty acids by filtration. These acids, as well as the glycerin, may be determined by known processes, the latter after the accompanying sulphuric acid has been saturated with barium carbonate.

The residue, insoluble in alcohol, after being weighed, is washed with cold water till the filtrate makes up exactly 60 c.c. The water is then driven out of the filter by means of alcohol, and the residue is dried at 100° .

After being weighed, the residue is submitted to microscopic examination, in order to detect starch. Mineral impurities are sought for by ordinary analytical methods.

Test for the Purity of Olive Oil. M. Conroy. (*Pharm. Journ.*, 3rd series, xi., 933.) The test recommended by the author is the one with nitric acid. But instead of relying, as is usually done, on the consistence of the resulting mixture, as an indication of purity or adulteration, he prefers to be guided by the colour produced. He suggests the following mode of applying the test:—

Mix thoroughly 1 part of strong nitric acid (sp. gr. 1.42) with 9 parts of the oil to be tested, and pour the mixture into a white porcelain dish, capable of holding at least 10 times the quantity. Apply heat gently, until the action between the acid and the oil is fairly set up, then remove the source of heat, and stir well with a glass rod until the action is over.

Pure olive oil thus treated and allowed to cool, sets into a pale

straw-coloured hard mass in an hour or two, while cotton-seed and other seed oils assume a deep orange-red colour, and do not set like olive oil.

In hot weather it is necessary to artificially cool the sample, so as to promote the setting; but to a practised eye the setting is quite unnecessary, the colour being sufficiently distinct without.

The Action of Oils on Metals. W. H. Watson. (From a paper read before the Chemical Section of the British Association at the Swansea Meeting, 1880.) The author has studied the solvent action of various oils on iron and copper. The iron was left in contact with the oils for twenty-four hours, and the amount dissolved then determined by analysis. The results of these determinations were as follows:—

| | Iron found. |
|---------------------------------|---------------|
| Neatsfoot Oil (English) | 0·0875 grain. |
| Colza „ | 0·0800 „ |
| Sperm „ | 0·0460 „ |
| Lard „ | 0·0250 „ |
| Olive „ | 0·0062 „ |
| Linseed „ | 0·0050 „ |
| Seal „ | 0·0050 „ |
| Castor „ | 0·0048 „ |
| Paraffin „ | 0·0045 „ |
| Almond „ | 0·0040 „ |
| Special Lubricating Oil | 0·0018 „ |

In a previous series of experiments made with copper, the metal was left in contact with the oils for ten days:—

| | Copper found. |
|-----------------------|---------------|
| Neatsfoot Oil | 0·1100 grain. |
| Colza „ | 0·0170 „ |
| Sperm „ | 0·0030 „ |
| Olive „ | 0·2200 „ |
| Linseed „ | 0·3000 „ |
| Seal „ | 0·0485 „ |
| Paraffin „ | 0·0015 „ |
| Almond „ | 0·1030 „ |

Owing to the length of exposure being different in the two series, it is difficult to deduce from them the relative rate of action of any of the oils on the two metals. However, it is shown that almond oil, which acted strongly on copper, acts very slightly on iron; in fact, with the exception of the paraffin and special lubricating oil (a mineral preparation), it acted less than any of the other oils upon iron. The same is shown, as already mentioned, as to the action of various other oils; thus, while sperm oil acts slightly on

copper, it acts considerably, compared with the others, on iron. Linseed, seal, castor, almond, and paraffin may be bracketed as having about the same and very little action on iron; while linseed, olive, neatsfoot, almond, and seal have the greatest action on copper.

The delicacy of this test is due to the great contrast in colour exhibited between genuine olive and seed oils, when operated on as described, so that an admixture of 5 per cent. of any seed oil with olive oil is readily detected. The test also admits of an approximate estimation of the amount of the adulterant, by comparing the resulting colour with that obtained from mixtures of pure olive oil and seed oils in various known proportions.

Adulterated Linseed Oil. A. H. Mason. (*Journ. Chem. Soc.*, 1881, 473.) The specific gravity of the sample reported upon was found to be 0.9146, that of genuine boiled linseed oil being 0.94. It flashed at 165.5° C.; genuine oil flashes at 282.2° C.

The sample was examined by Thomson's method. After having been saponified with alcoholic soda solution, it was mixed with sand and treated with light petroleum boiling below 87.7° C. The light petroleum, separated from the soap of the vegetable oil, was distilled below 104.4° C., and the residue of mineral oil weighed. It was found that 24 per cent. of mineral oil of 0.872 sp. gr., and 137.7° C. flashing point, had been extracted from the sample.

Determination of Fatty Acids in Oils. M. Carpentin. (*Journ. de Pharm. et de Chim.* [5], i., 501.) 50 c.c. of the oil and 100 c.c. of alcohol of 90 per cent., together with 8 or 4 drops of tincture of turmeric, are shaken briskly in a flask or medicine bottle capable of holding 250 c.c. Standard solution of sodium hydrate is then added gradually from a burette, and the mixture well shaken after each addition. When the alcoholic solution begins to assume a red colour, the mixture is strongly agitated till the yellow colour reappears, owing to the extraction by the alcohol of a fresh quantity of acid from the oil. The addition of the alkali is then proceeded with in the same manner until the red colour becomes permanent. Since the operation is carried on in the cold, and as the oil is perpetually insoluble in the alcohol, there is no danger of saponification. Each c.c. of the soda solution, equalling 0.04 gram of Na H O, corresponds to 0.282 gram of oleic acid, or to equivalent proportions of other fatty acids.

Examination of Petroleum. F. Skalweit. (*Chem. News*, xliii., 76.) The various kinds of petroleum which, at a lower temperature, develop inflammable gases, were found to have a sp. gr. under

0.800, while good sorts are considerably heavier, and rise to 0.824. The boiling points also are considerably lower. The author's experiments prove that the flashing points of various samples rise and fall with their specific gravities and boiling points.

Light Resin Oil. Dr. W. A. Tilden. (*Journ. Chem. Soc.*, 1881, 101.) The distillate boiling under 80° consists chiefly of *isobutaldehyde*; between $103\text{--}104^{\circ}$ a mixture of hydrocarbons distils; these partially polymerize on treatment with sulphuric acid diluted with 25 per cent. of water, and an oil, boiling between $245\text{--}247^{\circ}$, is obtained. Heated with sulphuric acid until sulphurous anhydride is evolved, a black liquid is obtained, which yields an intensely green solution when diluted with alcohol, and soon deposits a green precipitate. The hydrocarbons left undissolved by dilute sulphuric acid, heated with a mixture of concentrated and fuming sulphuric acid, separate into a portion not acted on, consisting apparently of a heptane (b. p. $95\text{--}97^{\circ}$, sp. gr. at 15° 0.763); whilst the green sulphuric solution, on dilution with water, yields a black precipitate, probably of the empirical formula, $\text{C}_{20}\text{H}_{28}\text{O}_3$. On oxidation with nitric acid this furnishes two acids, of which one readily crystallizes; these have not yet been examined.

When the fraction distilling between $103\text{--}104^{\circ}$ is shaken with water in contact with air, it yields the crystalline substance described by Tichborne (*Pharm. Journ.* [3], i., 302).

The fractions of higher boiling point were free from toluene, but contained an optically inactive terpene.

Detection and Determination of Heavy Mineral Oils, of Resin Oils, of the Fatty Oils, and of Resin in the Oils of Commerce. M. A. Rémont. (*Bull. de la Soc. Chim.* [2], xxxiii., 461–466; *Journ. de Pharm.* [5], ii., 136–140, and 213–216; *Chem. News*, July 23, 1880; *Pharm. Journ.*, 3rd series, xi., 190–192; and *Journ. Chem. Soc.*, 1880, 683, and 1881, 202.)

We call attention to this paper, as it may prove useful to some of our readers, but must confine our notice of it to the title. For the methods of analysis described in it, reference must be made to the sources quoted.

Products of the Distillation of Common Resin. A. Renard, (*Comptes Rendus*, xci., 419; *Journ. Chem. Soc.*, 1880, 893.) By subjecting colophony to several fractional distillations, and removing acids from the distillates by washing them with alkalis, a hydrocarbon (b. p. $103\text{--}106^{\circ}$) is obtained, for which the author suggests the name *heptene*. It is purified by washing with caustic soda, drying first over calcium chloride, and then over sodium,

and finally distilling over sodium in a current of carbonic anhydride. Its analysis and vapour-density correspond with the formula C_7H_{12} . It is a mobile colourless liquid, soluble in alcohol and ether, sp. gr. = 0.8031 at 20° ; it has a peculiar odour, and is without action on polarized light. It absorbs oxygen from the air, evolving carbonic anhydride.

When treated with chlorine, it forms a resinous mass, with evolution of hydrochloric acid. Bromine acts on the hydrocarbon with great violence. If, however, it is dropped slowly into the cooled hydrocarbon, and the mixture containing excess of bromine be allowed to stand in the shade for two or three days, a thick liquid is obtained which, after washing with alkalis, yields a yellow oil. By extracting the oil with ether and allowing the ethereal solution to stand, crystals of a hexa-bromo-compound, $C_7H_6Br_6$, separate out, (m. p. 134°), which decompose at 150° .

By allowing the above mixture of hydrocarbon and bromine to stand for 8-10 days in the sunlight, an isomeride of the above compound is obtained; a thick, oily brown liquid, decomposing at 150° .

A dibromide, $C_7H_{12}Br_2$, is obtained by dropping a solution of the hydrocarbon in ether into a cooled solution of bromine in ether, keeping the bromine in excess. On allowing the solution to evaporate spontaneously white crystals are formed, which are very unstable, decomposing a few minutes after their formation.

Nitric acid (sp. gr. 1.15) acts on the heptene at $80^\circ C.$, forming acetic, formic, oxalic and succinic acids, with evolution of carbonic oxide and carbonic anhydride. Fuming nitric acid acts with great violence on the hydrocarbon. Gaseous hydrochloric acid forms a green liquid with heptene, but no hydrochloride is formed. An aqueous solution of the gas is without action.

By treating the cooled hydrocarbon with concentrated or fuming sulphuric acid, an oily liquid is obtained, consisting of a mixture of unaltered heptene and diheptene, $C_{14}H_{24}$ (b. p. $235-240^\circ C.$). Diheptene is readily oxidized, absorbing oxygen eight or ten times more quickly than heptene. It has no action on polarized light. A sulphonic acid is also formed, which yields a very soluble barium salt.

Heptene unites with the elements of water, forming a crystalline hydrate.

Aldehyde Resin. G. L. Ciamician. (*Wien. Akad. Ber.* [2 Abth.], 346-357.) This paper contains a description of decomposition products formed from aldehyde resin by reduction with zinc dust,

by oxidation with nitric acid, and by fusion with potash. The resin used in these experiments was obtained by heating aldehyde with sodium acetate in sealed flasks at 100°C ., and afterwards removing the soluble products by distillation. On submitting this resin to the action of zinc dust, the author obtained a mixture of hydrocarbons composed of ethyl-benzol, meta- and para-ethyltoluene, and methyl-naphthalene. The oxidation with nitric acid yielded isophthalic acid, while the fusion with potash furnished hydroxyisophthalic acid, metahomosalicic (hydroxytoluic) acid, and metaxyleneol.

The Constitution of Benzol. J. Thomsen. (*Liebig's Annalen*, ccv., 133.) The author's investigation points to the conclusion that the six carbon atoms of benzol are united together by nine single bonds, and that the hypothesis hitherto adopted of a constitution of benzol with three single and three double bonds is not confirmed by experiment.

MATERIA MEDICA AND PHARMACY.

PART II.

MATERIA MEDICA AND PHARMACY.

Notes on Indian Drugs. W. Dymock. (*Pharm. Journ.*, 3rd series, xi., 21, 22, 169, and 170.) This is a continuation of the author's previous reports on the same subject, and comprises notices of the following drugs:—

The rhizome of *Acorus calamus*, *Araceæ*; the fruit of *Arum margaritifera*, *Araceæ*; the root of *Curculigo orchioidea*, *Hypoxidæ*; the bulb and leaves of *Crinum asiaticum*, *Liliacæ*; the tubers of *Cyperus rotundus*, *Cyperacæ*; the corm of *Hermodactylus*, *Colchicacæ*; and the root of *Smilax china*, *Smilacæ*. A description of the botanical characters and microscopical structure of each of these is given, together with the history, uses, etc.

Studies of the Genus Strychnos. G. Planchon. (*Journal de Pharmacie* [5], i., 19, 193, 293, 380, 488, and ii., 105; also *Pharm. Journ.*, 3rd series, xi., 469, 491, 529, 589, 693, and 754.) In this elaborate report the author deals with the following subjects:—

- I. The characters and structure of the barks and woods of various species of *Strychnos*.
- II. Plants entering into the composition of Curare.
- III. The Curare of the Orinoco.
- IV. The Curare of the Upper Amazon.
- V. The Curare of French Guiana.
- VI. The Curare of British Guiana.

For details respecting these reference must be made to the original article in the *Journal de Pharmacie*, or to the translation in the *Pharmaceutical Journal*, as they are not suited for abstraction.

Strychnos Triplinervia. MM. Couty and De Lacerda. (*Zeitschr. des oesterr. Apoth. Ver.*, 1880, 428, from *Journ. de Pharm. et de Chim.*) *Strychnos triplinervia* is the commonest of the Brazilian species of *strychnos*, and is distinguished from *S. castelnaea* and *S. tozifera* by being tree-like and not climbing, having smooth oval triplinerved leaves, and the very numerous flowers arranged in

cymes with tubular corollæ. Extracts made from the root are almost without poisonous action; but extracts made from the bark of either stem or root possessed decided toxic properties resembling those of curare. Though weaker than the latter, these extracts deserve attention, being obtained from a definite and well known plant, while curare is the product of a number of different plants, some of which are yet unknown.

Strychnos Ganthieriana. B. Raeber. (*Schweiz. Wochenschr. für Pharm.*, July 16th, 1880.) The bark of this shrub is used by the natives of Tongkin, under the name of *hoang-nan*, as a remedy for hydrophobia, snake bites, and certain forms of skin diseases. It is blackish grey, sometimes brownish, generally covered with a thin brownish yellow epidermis, and marked with longitudinal ridges. It resembles the bark of *Strychnos nux vomica*, but is more regular, much thinner, and exhibits in its transverse section fewer stone cells and more irregular striæ. It contains both strychnine and brucine. The dose of the bark is $\frac{1}{4}$ to $\frac{1}{2}$ grain, given in the form of a decoction, tincture, or extract.

Indian Henbane. W. Dymock. (*Pharm. Journ.*, 3rd series, xi., 369.) Henbane, though a native of the Himalayas, was probably unknown as a medicine to the ancient Hindu physicians. "Parasika-yamani" and "khorasani-yamani," the names which it bears in some recent Hindu books, indicate its foreign source. Mahometan writers call it "banj," an Arabic corruption of the Persian "bang." They say it is the "afeekoon" of the Greeks, the "azmalus" of the Syrians, and the "katfeet" or "iskeeras" of the Moors. They also add that in the Deilami dialect it is called "keer-chak," because the capsules resemble a little basket with a cover, such as the Arabs make out of date leaves and call "kafeer." Meer Muhammed Husain's description of "bang" in the "Makhzan-ul-adwiya" agrees well with the genus *Hyoscyamus*. He says there are three kinds, white, black, and red, and that the white is to be preferred. He mentions the preparation of a sun-dried extract from the juice of the fresh leaves, and says that the leaves are also pounded and made into a paste with flour, out of which small cakes are formed, which when dry retain their medicinal properties for some time.

Henbane is described by eastern writers on materia medica as intoxicating, narcotic, and anodyne. Amongst the many uses to which it is put, the following may be mentioned as peculiar to the East:—A poultice of the juice with barley flour is used to relieve the pain of inflammatory swellings; the seeds in wine are applied

to gouty enlargements, inflamed breasts, and swelled testicles. About $\frac{1}{2}$ a dram of the seeds with 1 dram of poppy seeds are made into a mixture with honey and water and given as an anodyne in cough, gout, etc. Equal parts of the seed and opium are used as a powerful narcotic. A mixture of the powdered seeds with pitch is used to stop hollow teeth which are painful, and also as a pessary in painful affections of the uterus. The juice or a strong infusion of the seeds is dropped into the eye to relieve pain. Ainslie and other European writers upon Indian materia medica notice the use of *hyoscyamus* seeds in India, and attribute them to *H. niger*, but I have not heard of any one who has raised this plant from the bazaar seed. In the "Mufaridat-i-Násari" it is distinctly stated that the official article should be the seed of white henbane (*bazr-ul-banj-abiad*).

Henbane seed is the only part of the plant used in native practice in India; it is known in Hindostan as "khorasani ajwain," in Bombay as "khorasain owa," and in Madras as "khorasain omam."

For the purpose of supplying Government hospitals with extract and leaves, the *Hyoscyamus niger* has been cultivated at Saharanpore, in the Bengal Presidency, at Hoonsoor, in Mysore, and at Hewra, near Poonah, in the Deccan. As regards medicinal qualities, the experience of medical men in India is that the plant cultivated for Government yields preparations in every respect equal to those obtained from Europe.

Contributions to a Closer Knowledge of Some Little Known Leaves. Dr. H. Paschkis. (*Pharm. Journ.*, 3rd series, xi, 813, 855, 913, 1003, and xii, 44 and 85.) The report contains descriptive notices and woodcut illustrations of the following:—

Various kinds of true and false *Patchouli* leaves.

Henna leaves and powder from *Lawsonia alba*.

Leaves of *Angræcum fragrans*.

Leaves of *Liatris odoratissima*.

Eupatorium Ayapana.

Herba Oenopodii anthelmintici.

Leaves of *Piper Betle*.

Leaves of *Kalmia latifolia*.

Japanese Aconite. D. V. Wasowicz. (*Archiv der Pharm.*, xiv., 217.) The author gives a botanical description and an account of the microscopical characters of two kinds of Japanese aconite, together with woodcuts of the tubers, the transverse and longitudinal sections and starch granules. These woodcuts will also be found accompanying a translation of the paper published in

the *Pharmaceutical Journal*, Aug. 28th, 1880, to which we refer the reader, as the paper is not suited for abstraction.

Japanese Aconite. M. Geerts. (*Pharm. Journ.*, 3rd series, xi., 351; from *Pharmaceut. Zeitung*.) The author, writing from Yokohama, asserts that *Aconitum Fischeri* is the only source of Japanese aconite. The Japanese distinguish between two kinds of the drug, namely "ü-dzu," the principal tuber, and "bü-shi," the younger but more poisonous tubers, of which there may be five or six to a plant. The latter tubers are said to form the drug used in Japan, but the first undergo a special preparation, having for its object partly to render them less toxic, and partly to preserve them from decay and from insects. This consists in steeping the fresh tubers for a long time in a mixture of common salt, vinegar, and water, then drying them in wood-ashes, and afterwards in the sun. Besides agreeing with the experience that two kinds of roots are met with in the market under the name of Japanese aconite, these details may furnish an explanation of the peculiar condition of some of the specimens, which has been pointed out by Mr. Greenish, and also of the fact that the crystallizable alkaloid cannot always be obtained from these tubers.

Japanese and Chinese Aconite Roots. Dr. A. Langgaard. (*Pharm. Journ.*, 3rd series, xi., 1021-1025, and 1041-1045.) A long descriptive account with copious woodcut illustrations of a number of different kinds of Japanese and Chinese aconite roots. From one of the Japanese roots the author obtained a most poisonous crystallizable alkaloid far exceeding in tonic power aconitine and pseudaconitine. This and other alkaloids from the various roots reported upon are still under investigation, and a further account is promised.

As regards the nomenclature and the botanical and microscopic descriptions of the different roots given in the paper, it is impossible to furnish a useful account in the form of an abstract. We must, therefore, refer the reader to the original.

The Constituents of Japanese Belladonna (*Scopolia Japonica*). Dr. A. Langgaard. (*New Remedies*, June, 1880.) The author has succeeded in isolating from this root two distinct alkaloids, which he proposes to name *rotoine* and *scopoleine*. Both appear to be similar to atropine in their physiological action. This subject is still under investigation.

The Harmlessness of *Æthusa Cynapium*. Dr. J. Harley. (*St. Thomas's Hospital Reports*, vol. x.) The author has previously shown that, contrary to general opinion, "fool's parsley"

(*Æthusa Cynapium*) does not possess toxic properties. As, nevertheless, modern works continue to speak of this plant as a poison, he has now reinvestigated the subject, with results clearly proving that *Æthusa Cynapium* is as harmless as ordinary parsley. He expressed the juice from both immature and mature plants, and administered them in doses varying from two drams to eight ounces, without producing the slightest toxic effect.

These results ought to dispose, once for all, of a popular fallacy which has existed for generations.

Jaborandi Leaves. Dr. A. Poehl. (*Pharm. Zeitschr. für Russland*, 1880, No. 8, and *New Rem.* Feb., 1881.) The author records experiments carried out with the object of establishing a reliable process for the valuation or assay of jaborandi leaves and of pharmaceutical preparations made from them. All attempts to determine the quantity of alkaloid by titration, either with Mayer's solution (13·546 grams of mercuric iodide and 49·8 grams of potassium iodide in 1 litre of water), with potassium-bismuth iodide, or with phosphomolybdic acid, gave unsatisfactory results. The best way was found to determine the alkaloid gravimetrically, as phosphomolybdate.

The assay of the leaves is conducted as follows :—After being cut, they are infused in hot water containing 1 per cent. of hydrochloric acid; the infusion is precipitated by basic acetate of lead, and the filtrate from this mixed with hydrochloric acid until no more chloride of lead is thrown down. From the filtered liquid the *pilocarpine* is now precipitated by adding an excess of phosphomolybdic acid, the precipitate is washed with water containing hydrochloric acid, dried at 100° C. and weighed; 100 parts of the phosphomolybdate correspond to 45·66 parts of *pilocarpine*.

The pilose leaves of *Pilocarpus officinalis* [a species, the existence of which has been assumed by the author on the basis of anatomical differences from the leaf of *P. pennatifolius*, but which still requires confirmation] yielded, on an average, 1·97 per cent. *pilocarpine* by this method; the hairless leaves, 1·86 per cent.; the bark of branches and stem, 0·408 per cent. On the other hand, the leaves of *Pilocarpus pennatifolius* yielded only 0·159 per cent.

Before the tincture can be assayed in this manner, the alcohol must be removed. The infusion may be at once used as such, but the extract must be dissolved in acidulated water.

A False Jaborandi. Dr. A. Tschirch. (*Pharmaceut. Zeitung*, 1881, 305.) The author calls attention to a spurious jaborandi, the botanical source of which is at present unknown, but is probably a

member of the *Rutaceæ*. The leaves are brighter green than the genuine drug, and are less prominently veined. A transverse section of the spurious leaf shows the epidermal cells to have thicker walls than that of true jaborandi. The palisade cells below the epidermis are twice as deep as the epidermal cells, while in the genuine leaf they are only equal in depth to the latter.

The author's description is illustrated by woodcuts of the leaves, and transverse sections both of the spurious and the true jaborandi.

Fucus Vesiculosus. F. Frisby. (From an inaugural essay published in *Amer. Journ. of Pharm.*, Sept., 1880.) The author records the results of an analysis of this drug, showing it to have the following composition:—

| | |
|-------------------------------|------|
| Water | 22·6 |
| Organic matter | 61·5 |
| Ash | 15·9 |
| Potassium Chloride | 3·48 |
| Sodium Iodide | 2·52 |
| Sodium Bromide | 3·24 |
| Magnesium Phosphate | 3·12 |
| Calcium Phosphate | 2·25 |
| Calcium Sulphate | 1·38 |

Chian Turpentine. A. Janssen. (*Pharm. Zeitung*, October 23rd, 1880, and *Amer. Journ. Pharm.*, December, 1880.) The author having had an opportunity of obtaining through a Grecian physician an authentic specimen of Chian turpentine, collected on the island of Chios from *Pistacia terebinthus*, has considered it of interest to describe its properties and appearance, particularly as the small yield and increased demand for the drug has given rise to its falsification, and the difference between it and that exported from England being considerable. The turpentine obtained from England had the appearance of Canada balsam mixed with more or less Venice turpentine, with a decided terebinthinous odour and taste, a golden-yellow colour, and brightly liquid, without any observable impurities. That collected by himself had the consistence of old liquid storax, brittle, and but slightly sticky when handled.

By transmitted light it is not transparent, but appears tolerably so when thin layers are held towards the light, and would then appear quite transparent were it not for the many dispersed black spots arising from small enclosed particles of the bark of the tree. The colour, as observed in a mass, is brown with a greenish tint, and in some pieces appears brownish yellow. The odour is neither that

of turpentine nor of fennel, as stated by some, but has much similarity to the odour developed when colophony and yellow wax are melted together. The taste is exceedingly mild, neither bitter nor acid. A solution in rectified spirit is not perfectly clear, gives upon standing an insignificant precipitate, and feebly reddens litmus; in ether, acetone, and amylic alcohol it dissolves to form a nearly clear liquid. For internal use it is best prescribed in the form of pills, and the following formula is recommended: Terebinth. chia, 4·0 grams; sulphur depurat., 1·5 gram; pulv. rad. glycyrrh. q. s. ut ft. pilul. No. 30. S. Two pills every 4 hours.

For external use it is best employed according to the following formula: Terebinth. chia, 5·0 grams; vaselin, 30·0 grams. Mix with the aid of a gentle heat.

Chian Turpentine. Prof. Flückiger. (*Pharm. Journ.*, 3rd series, xi., 609.) As the island of Chio is not likely to yield a good and regular supply of this drug, the author points out that *Pistacia Terebinthus* grows plentifully in Algeria, and that these Algerian trees exude an abundance of this turpentine in the form of white fragrant tears which rapidly solidify. A large tree is said to yield 7 to 14 ounces annually.

Pistacia atlantica, which is met with all over Northern Africa, is also mentioned as a likely and prolific source of this oleo-resin. According to the authors of "Pharmacographia," this is but a variety of *P. Terebinthus*, while Mathien considers it as a distinct species. But even the latter is of opinion that it affords abundance of the same turpentine. In the author's opinion, the supply from both sources might be largely increased by systematically puncturing the bark.

It is possible, therefore, to obtain large quantities of Chio turpentine at a moderate rate, so as to enable the medical profession to settle the question of its merits.

Chian Turpentine. Dr. A. H. Allbutt. (*Lancet*, January 22nd, p. 158.) The author reports upon a case of medullary cancer, of a fungoid type, in which the treatment with Chian turpentine was so far successful as to alleviate the suffering and to prolong the life of the patient.

Palembang Benzoin. E. Saalfeld. (*Archiv der Pharm.*, 3rd series, xvi., 280.) For some time a cheap kind of benzoin, under the name of palembang benzoin, has occurred in the markets. It comes from Sumatra, but differs from ordinary Sumatra benzoin, and also from the Siamese drug, by yielding a tincture which is paler, weaker in odour, and produces no milkiness when dropped

into water, but a flaky precipitate, although alcohol dissolves as much from this as from Siam benzoin. It should, therefore, not be used for making the tincture of benzoin. It contains no cinnamic acid, but yields at least 10 per cent. of pure benzoic acid.

The Balsam of Myroxylon Peruiferum. T. Peckolt. (*Zeitschr. des oesterr. Apoth. Ver.*, 1880, 130, and *Pharm. Journ.*, 3rd series xi., 819.) When compared with true balsam of Peru, the balsam obtained from *M. Peruiferum* exhibits the following differences:—

| Sp. gr. 0.160, <i>M. Pereira</i> . | Sp. gr. 0.955, <i>M. Peruiferum</i> . |
|--|---|
| Taste warming to the tongue; then burning the throat; bitter and aromatic; odour agreeable, like vanilla. Yields a volatile oil when distilled with water. | Taste slightly pungent, but not warming: aromatic and astringent; odour aromatic. Gives only traces of a volatile oil. |
| Mixes with chloroform in all proportions. | Acts in the same manner, but deposits a powdery precipitate on standing. |
| Dissolves in six parts of alcohol of 90 per cent., and gives, after a time, a fawn-coloured deposit. | Soluble in alcohol of 90 per cent. in all proportions, and forms no deposit. |
| Ether, benzin and petroleum spirit dissolve only the yellow oil (cinnamon). | Insoluble in these three liquids. |
| Bisulphide of carbon only partially dissolves it, giving a yellow solution. | Bisulphide of carbon partially dissolves it, forming a clear light brown solution. |
| Castor oil takes up 15 per cent. | Mixes with castor oil in all proportions. |
| Equal volumes of balsam and concentrated sulphuric acid mixed give a stiff mixture which, kneaded with water, yields a brittle resin which is not sticky when pressed between the fingers. | The same treatment causes the formation in twelve hours of a gelatinous mass of a reddish-black colour, which kneaded with water colours it dirty green; the mass, after washing, is sticky, and of greasy consistence. |

In many points the balsam from the wood of *M. Peruiferum* agrees with balsam of Peru, and the author thinks it could for many medicinal purposes replace that more expensive drug, and might be distinguished in commerce as Brazilian balsam. He states that he has used it with remarkable success as a balsam for wounds and in the treatment of scabies.

The Origin of the "Gum" of Quebracho Colorado. Dr. A. Vogl. (*Pharm. Journ.*, 3rd series, xi., 1.) From the result of a careful microscopic examination of the transverse section of *Quebracho Colorado* (*Loxopterigium Lorentzii*), the author infers that the so-called "gum"-forming constituents appear first of all as cell contents in the wood; that these under certain conditions, and in some parts, are increased at the cost of the cell wall; and further, that

in the first place secondary layers undergo this metamorphosis, and lastly the primary membrane.

The paper contains a full description of the structure of the wood, illustrated by woodcuts.

Species of *Ruscus*. (*Amer. Journ. of Pharm.*, January, 1881.) Of the genus *Ruscus*, which is classed with the Smilacæ or Liliacæ, three species have been employed medicinally, all of which are indigenous to southern Europe, one—*R. aculeatus*, Lin., or butcher's broom—being also found in England. The rhizome, known as *radix rusci* or *brusci*, possesses aperient and diuretic properties, and was formerly much used in visceral diseases.

The other two species referred to are *Ruscus hypophyllum* and *R. hypoglossum*, Lin., the former of which was known as *laurus alexandrina*, the latter as *bilingua*, *uvularia*, *laurus alexandrina angustifolia*. The root and evergreen leaves were employed in diseases of the uterus and bladder.

Species of Rhubarb. H. von. Schlagintweit. (*Zeitschr. des oesterr. Apoth. Ver.*, 1880, 170.) The species described by the author were found by him on the south side of the Himalaya and in Thibet, and comprise the following:—*Rheum Emodi*, *R. leucorrhizum*, *R. Webbianum*, *R. moorcroftianum*, and *R. spiciformes*.

Gigantic Rhubarb. (*Pharm. Journ.*, 3rd series, xi., 860.) According to the *Journal de St. Petersburg*, Colonel Przewalsky, while making his way from Sining-fu to the sources of the Yellow River, passed through a plateau where a rhubarb plant grows wild, and attains an extraordinary development. Roots were found which were 16 in. long, 12 in. broad, and 7 in. thick, and weighed 26 lbs.

The Beneficent and Toxic Effects of the Various Species of *Rhus*. T. J. W. Burgess. (*Pharm. Journ.*, 3rd series, xi., 858, from *Canadian Journal of Medical Science*.) The species of *Rhus* dealt with in this paper comprise the following:—*Rhus cotinas*, *R. coriaria*, *R. succedanea*, *R. vernicifera*, *R. Metopium*, *R. semialata*, *R. aromatica*, *R. glabra*, *R. copallina*, *R. typhina*, *R. pumila*, *R. diversiloba*, *R. venenata*, and *R. toxicodendron*.

The subject of the paper not being suited for abstraction, reference must be made to the original paper.

Eupatorium Perfoliatum. G. Latin. (*Amer. Journ. of Pharm.*, 1880, 392.) *Eupatorium perfoliatum* has been analysed by Peterson (1851) and Bickley (1854); but, as they found nothing but the usual constituents of herbs, the writer thought it would be of some importance to make still further investigations.

The leaves and tops of the plant, reduced to a moderately fine

powder, and packed in a percolator, were treated with 95 per cent. alcohol until exhausted. The alcohol was distilled off, and the residue evaporated to the consistence of an extract by a very gentle heat. This extract was then treated with ether, which dissolved out the bitter principle and colouring matters, leaving a greyish, gummy-like mass, entirely soluble in water, and proved by Trommer's test to be sugar.

The ethereal tincture was then placed in a flask, and the ether carefully distilled off by means of a water-bath, and evaporated to a semi-solid consistence, which was then treated with petroleum benzin, by means of which a large amount of colouring matter, fat, etc., was removed. The benzin solution, upon being permitted to evaporate spontaneously, yielded a number of small crystals in an impure condition, which adhered to the sides of the vessel. These were washed very rapidly with petroleum benzin and then with ether, which left them in the form of pure white, needle-shaped, tasteless crystals, and were insoluble in alcohol, ether, water, and alkaline solutions. When treated with sulphuric and nitric acids separately no change was produced, but subjected first to the action of nitric and then of sulphuric acid, a beautiful carmine-red was produced, changing after a short time to an orange-yellow; with hydrochloric acid a beautiful emerald-green, and with potassium bichromate with sulphuric acid a greenish violet was developed. Heated to redness on platinum foil, no residue is left and no odour given off. The crystals have a comparatively low fusing point; on placing a few of them on a piece of notepaper and holding them over the flame of a Bunsen burner, they melt, leaving a greasy stain, but not sufficiently strong to render the paper transparent. The author believes these crystals to be wax or resin, but from want of materials he has not been able to make fuller examination of them.

The residue left after treating with benzin was then dissolved in alcohol and filtered. Upon the filter there was left a black powder, which was unaffected by alcohol, water, alkalies, and concentrated acids, and when heated was consumed, leaving an ashy residue.

The filtrate was then treated with an alcoholic solution of acetate of lead, which caused a copious precipitate of colouring matter; this was separated by a second filtration, and the liquid treated with sulphuretted hydrogen, by which the lead was eliminated. The liquid being boiled, was thus freed from sulphuretted hydrogen. After this, purified animal charcoal was left in contact with it for three days, the whole being shaken occasionally. By this means the solution was nearly deprived of colour; it was then concentrated

and treated with boiling water until its bitterness was removed, and the residue was a resinous, tasteless mass.

The aqueous solution thus obtained was again evaporated and treated with chloroform, which dissolved out a bitter principle and left a tasteless, resin-like mass in the vessel.

The chloroform solution, when evaporated, left the bitter principle in a pure condition, and this was named eupatorin. When tested by Trommer's test it gave no reaction, but when first boiled with sulphuric acid it gives a red coloured precipitate, and by sulphuric acid alone a white precipitate was occasioned, showing it to be a glucoside.

Eupatorin has a slightly acid taste, and is soluble in alcohol, chloroform, ether, boiling water, and concentrated acids; with sulphuric acid a dark reddish brown colour is produced, and with hydrochloric and nitric acids a light yellow colour results.

Eupatorin, when pure, is wholly dissipated by heat, and when boiled with sulphuric acid and water the odour of raspberries is given off.

Aqueous Percolate.—After the herb was treated with alcohol, it was exhausted with water, and the solution evaporated to the consistence of an extract, having an astringent taste, and giving the following reactions:—With ferric chloride a dark green colour was produced; with solution of gelatin a light brown precipitate was formed, and by placing this in a filter and washing it with cold water several times, ferric chloride gave a dark colour to that part of the filter that had been in contact with the precipitate, proving the presence of tannin; with tartar emetic, no precipitate. Alcohol gave a precipitate of gum from an aqueous solution. 5 grams of the herb, when exhausted with sulphuric ether, upon evaporating yielded an extract weighing 54 centigrams, having no bitter taste, and nearly all soluble in benzin, supposed to be colouring matter. A small quantity of volatile oil was obtained by distilling the herb with water, having the disagreeable odour of boiled cabbage. 5 grams of the herb lose 37 centigrams of moisture when heated to dryness.

The chemical constituents of the herb are as follows:—Eupatorin (a glucoside), a crystallizable body (resin?) a volatile oil, gum, tannic acid, sugar.

A previous analysis of this plant was published by P. Collier in 1879 (see *Year-Book of Pharmacy*, 1880, 195).

Agaricus Integer, L. (*Russula Integra*). W. Thoerner. (*Journ. de Pharm. et de Chim.*, 1881, No. 41.) The author reports having

isolated from this plant a new vegetable acid, the composition of which answers to the formula $C_{15}H_{30}O_8$. It crystallizes in small needles, fusing at $70^\circ C.$, insoluble in water, but soluble in ether, benzol, chloroform, and boiling alcohol. Its ammonium salt forms laminar crystals, while its combinations with the fixed alkalies are amorphous.

The Composition of Black and White Mustard. (C. H. Piesse and L. Stansell. (*Analyst*, September, 1880.) The constituents are tabulated as follows:—

Analysis of White Mustard.

| | Mustard Whole Seeds. | | Mustard Farina. | | |
|-------------------------------|----------------------|-------------|-----------------|-------|----------|
| | York-shire. | Cam-bridge. | Super-fine. | Fine. | Seconds. |
| Moisture | 9.32 | 8.00 | .30 | 5.78 | 6.06 |
| Fat | 25.56 | 27.51 | 37.18 | 35.74 | 32.55 |
| Cellulose | 10.52 | 8.87 | 8.90 | 4.15 | 9.34 |
| Sulphur | 0.99 | 0.98 | 1.83 | 1.22 | 1.26 |
| Nitrogen | 4.54 | 4.49 | 5.05 | 4.89 | 4.25 |
| Albuminoids | 28.37 | 28.06 | 31.56 | 30.56 | 26.56 |
| Myrosin and Albumen | 5.24 | 4.58 | 7.32 | 6.67 | 6.11 |
| Soluble Matter | 27.88 | 26.29 | 36.31 | 36.60 | 33.90 |
| Volatile Oil | 0.06 | 0.08 | 0.08 | 0.04 | 0.08 |
| Ash | 4.57 | 4.70 | 4.22 | 4.31 | 4.30 |
| „ soluble | 0.55 | 0.75 | 0.44 | 0.55 | 0.38 |

Analysis of Black Mustard.

| | Mustard Whole Seeds. | Mustard Farina. | | |
|-------------------------------|----------------------|-----------------|-------|----------|
| | Cam-bridge. | Super-fine. | Fine. | Seconds. |
| Moisture | 8.52 | 4.35 | 4.52 | 5.63 |
| Fat | 25.54 | 36.96 | 33.02 | 36.19 |
| Cellulose | 9.01 | 8.09 | 2.06 | 3.26 |
| Sulphur | 1.28 | 1.50 | 1.48 | 1.30 |
| Nitrogen | 4.88 | 4.94 | 5.01 | 4.31 |
| Albuminoids | 26.50 | 29.81 | 30.25 | 26.06 |
| Myrosin and Albumen | 5.24 | 6.46 | 6.78 | 6.14 |
| Soluble Matter | 24.22 | 31.64 | 32.78 | 31.41 |
| Volatile Oil | 0.473 | 1.437 | 1.500 | 1.381 |
| Potassium Myronate | 1.692 | 5.141 | 5.366 | 4.940 |
| Ash | 4.98 | 5.04 | 4.84 | 4.91 |
| „ soluble | 1.11 | 1.01 | 0.98 | 0.77 |

The ash consists mainly of phosphates and sulphates of potassium, calcium, and magnesium, along with a small proportion of iron and silica, and mere traces of sodium and chlorine. The phosphoric acid varies from 32 to 44 per cent., and amounts to about three times as much as the sulphuric acid. Carbonates are entirely absent. Practically no difference exists in the composition of the ashes of the two varieties, so that no analytical indications can be obtained from a mere examination of the ash. A full statement of the results of the ash analyses of the different kinds will, however, be found in the original paper.

In the process of manufacture, the sifting chiefly removes the husk and dries the farina, the other constituents being, as it were, concentrated. This is well seen in the amount of volatile oil in brown mustard. Again, the fat, which averages about 25 per cent. in the seeds, reaches 37 per cent. in the farina; the sulphur is increased nearly one half per cent., and so on with the other constituents; while the cellulose falls about two-thirds, and the moisture about one-half.

The white seeds differ in composition from the brown, chiefly in not yielding volatile mustard oil, in the fact that the sulphur is lower, and the soluble matters higher in the former than in the latter.

Characteristic Tests.—I. The aqueous extract of white mustard yields with solution of ferric chloride a deep blood-red coloration; this reaction is so slight as to be scarcely apparent with a similar extract of black mustard.

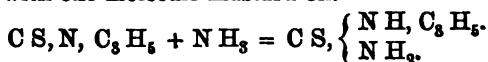
II. The aqueous extract of white mustard acquires in a few hours a powerful odour of sulphuretted hydrogen: that of black mustard smells only of the pungent mustard oil.

The following is recommended as a good process for the estimation of the volatile oil in black mustard:—

About 25 grams of crushed brown seeds are mixed with about a quarter of their weight of white seeds (also crushed) in a 500 c.c. flask, 300 c.c. cold water added, and allowed to stand for five or six hours. The highest yield of oil is obtained by standing for this length of time, and sensibly diminishes after six hours, gradually decomposing in contact with the myrosin; the yield after the lapse of forty-eight hours will reach only about two-thirds of that originally present, while after a week not one-third of the whole will be obtained. We have found, after numerous trials, that not less than three hours nor more than six should be allowed to elapse between the addition of the water to the mustard and its distillation, the rule finally adopted being to allow the mixture to stand for five hours.

The flask is then to be connected with a small Liebig's condenser, and the liquid distilled until no more oily drops are seen to come over. The distillate is received in a small flask (150 c.c.), containing 30 c.c. ammonia, sp. gr. 0.88. When the distillation is judged complete, the flask is disconnected, and, after removing the flame, shaken. If the steam possesses the sharp pungent odour of mustard oil, the contents are further distilled. This test is very sensitive. When the boiling proceeds rapidly, after 50 c.c. have come over, it will almost invariably be found that the mustard is entirely deprived of volatile oil. The distillation finished, the condenser is well rinsed out with cold distilled water into the receiver (this is necessary), the flask corked and put aside until the oily drops have quite disappeared, being occasionally shaken for this purpose; at least twenty-four hours are usually requisite. When the change is complete the flask is covered with a porcelain crucible lid, and boiled for a few minutes to expel the ammonia to a weighed platinum basin, and evaporated to dryness on the water-bath, subsequently dried in the water-oven, and weighed. The amount of thio-sinamine thus obtained is multiplied by .85344: the product is the quantity of allyl iso-thiocyanate contained in the mustard operated upon. If the factor 3.5775 be used, the amount of potassium myronate is ascertained.

Thio-sinamine is formed by the union of one molecule of ammonia with one molecule mustard oil.



The results of over forty experiments upon the amount of volatile oil present in brown mustard are here shown, a few of the separate determinations being given:—

| | | | | | Volatile Oil per cent. |
|-------------------------|-------|-------|-------|---|---------------------------|
| Whole Mustard Seeds | 0.486 | 0.465 | 0.468 | . | Average 0.473 |
| Brown Farina, Superfine | | 1.489 | 1.486 | . | „ 1.487 |
| „ „ Fine | 1.51 | 1.49 | 1.50 | . | „ 1.500 |
| „ „ Seconds | 1.358 | 1.418 | 1.367 | . | „ 1.381 |

The paper concludes with a description of the principal reactions of thio-sinamine, comprising its behaviour with nitric acid, silver nitrate, mercuric chloride, platinic chloride, Mayer's reagent, Nesseler's solution, and picric acid.

Eriodictyon Californicum. W. C. Holzhauser. (*Amer. Journ. of Pharm.*, August, 1880.) The author has examined the leaves of this plant, and has found them to contain sugar, wax, a resinous substance analogous to caoutchouc, a tannin striking green with

ferric solutions, and a crystallizable acid substance devoid of odour and taste. The yield of these crystals was too small for further investigation. No alkaloids could be detected.

The process of analysis employed is fully described in the paper.

Scybalium Fungiforme. Dr. T. Peckolt. (*Zeitschr. des oesterr. Apoth. Ver.*, 1880, 369.) This plant belongs to the order *Balanophoraceæ*, sub-order *Scybalaceæ*, and is popularly called in Brazil "Esponja de raiz" (rootsponge), and "Cogumello de sangue" (blood-fungus).

The tubers of this parasitic plant have been examined by the author, and found to contain a crystallizable alkaloid, "scybaline," and a crystallizable acid "scybalic acid," and a peculiar bitter principle. 1,000 parts of the fresh tubers were found to contain,—

| | |
|---|---------|
| Yellow soft Resin (resembling caoutchouc) . | 0.735 |
| Brown Acid Resin | 1.746 |
| Albuminoid substance | 0.840 |
| Scybaline | 0.050 |
| Scybalic Acid | 0.061 |
| Bitter Principle | 1.659 |
| Nitrogenous Extractive | 3.100 |
| Glucose | 6.847 |
| Starch | 19.740 |
| Malic Acid | 0.131 |
| Pectic Substances | 5.580 |
| Dextrine, and Mineral Substances | 15.660 |
| Moisture | 927.240 |
| Cellulose | 13.181 |
| Mucilage | 8.930 |

Scybaline crystallizes in small white transparent needles, of a bitter pungent taste, but without odour. It is difficultly soluble in cold water, but readily soluble in boiling water, alcohol, and ether. The solution forms precipitates with chloride of gold and perchloride of platinum.

Scybalic acid forms small white granular crystals, soluble in water, alcohol, and ether. Its aqueous solution forms a brown flocculent precipitate with ferric chloride.

The bitter principle is a brown, amorphous, hygroscopic substance, soluble in water and alcohol, but insoluble in ether. Its aqueous solution is neutral, and forms yellow precipitates with mercuric chloride and perchloride of platinum.

The starch granules, are peculiar in form and markings (vide woodcuts in original paper).

Tannin is entirely absent in this parasite.

Note on Hungarian Red Pepper. H. B. Brady. (*Pharm. Journ.*, 3rd series, xi., 469.) *Paprika*, the red pepper of the Hungarians, is prepared entirely from the fruit of *Capsicum annum*. Of this species, which is extensively grown in Hungary, there exist a great number of varieties, distinguished by the size and shape of the fruits, and their milder or sharper flavour. The larger fruits are as a rule comparatively mild, and have a sweetish taste of their own; whilst the small pointed sorts are commonly the more pungent. The degree of pungency, as well as the particular flavour, is said to depend in part upon locality, and in part also upon method of cultivation.

The *Szagediner paprika* is the sort most esteemed by the Hungarians. Some specimens of this variety which have been sent to the author resembled the large capsicums seen in our own markets, except that they are broad or truncate at the apex, instead of pointed. The pepper is ground with very little preliminary drying, hence there is considerable difficulty in keeping the powder. It is the custom to put it on the table in a salt-cellar, not in a cruet; but many Hungarian dishes are seasoned with it before being brought to table. When fresh, it is an agreeable condiment; but if kept in an open vessel it becomes dry and tasteless, whilst in a closed one it soon turns mouldy.

The Constituents of *Podophyllum Peltatum*. Dr. V. Podwysotzki. (*Archiv für experiment. Pathol. and Pharm.*, October 30th, 1880; *Chem. and Drug.*, December, 1880.) The following constituents were isolated by the author from *podophyllum* rhizome, and from *podophyllin* :—

1. A colourless and difficultly crystallizable and very poisonous substance (1–5 mg. being sufficient to kill a cat), of a very bitter taste, only slightly soluble in water, but very soluble in alcohol, forming a slightly acid solution. This he proposes to call *podophyllotoxine*.

2. By treating the above substance with solution of ammonia or calcium hydrate, two further substances were obtained. One of these, named by him *picropodophyllin*, is crystallizable, chemically indifferent, insoluble in water, poisonous, and intensely bitter in taste; the other, to which the name *podophyllic acid* has been given, combines with the alkali employed, and when liberated from this combination is found to be easily soluble in hot water, and strongly acid to test paper.

3. A harmless substance, crystallizing in yellow needles, resembling quercetin in its properties.

4. A considerable quantity of a green oil, as well as of a crystalline fatty acid, both toxicologically inert.

In preparing the toxicologically active principles of *podophyllum peltatum* in a pure state, care must be taken to separate out, as far as possible, the substances 3 and 4. The author's method is as follows:—Commercial or self-prepared podophyllin, finely triturated, is placed in a capacious flask, covered with about ten times its volume of chloroform, and the whole digested for some time on a water-bath. The chloroform is filtered off from the insoluble residue in the flask, and this is treated with a fresh quantity so long as the washings come off coloured and perceptibly bitter; as a rule, this operation must be renewed six or eight times. The washings are then collected and placed in a distilling vessel, from which the chloroform is distilled off until the residue has assumed the consistence of a thin syrup. The remainder of the chloroform is then expelled by evaporating on a water-bath. If the distillation is continued too long, the tenaciousness of the mass renders its removal from the distilling vessel very difficult. The concentrated extract is then lixiviated with petroleum-ether on a water-bath, until every trace of fatty matter is dissolved out. The first portions of the petroleum-ether used show a deep green, the last portions a light green colour. During the digestion with petroleum-ether, the tenacious magma swells up a good deal and requires constant stirring. In proportion as the fatty matters are extracted, the mass gets more friable, and becomes at last a pale yellowish grey powder. In evaporating the petroleum-ether washings, a deep green oleaginous substance is obtained, from which, after a time, a colourless fatty acid crystallizes out, the mother-liquor consisting of a green, unpleasant-smelling oil. The author has not examined the chemical nature of these two substances, since he found them to be toxicologically inactive. Petroleum-ether, therefore, dissolves out no active principle from *podophyllum*, while the chloroform is extremely rich in such.

The substance resembling quercetin, and which is likewise inert, being insoluble in chloroform, does not therefore pass into the chloroform extract. The author, therefore, considers chloroform the best menstruum for extracting the active principles of *podophyllum*. He is engaged in examining the chemical constitution of these active principles, and promises a further report on this subject.

Podophyllin. I. Guareschi. (*Gazzetta Chim. Ital.*, x., 16–20.) The author has examined the podophyllin of commerce obtained

from *Podophyllum peltatum*, and finds it consists of two substances, a resin soluble in ether, and a glucoside which is not soluble in ether. This glucoside is decomposed by the action of emulsin, or when boiled with dilute sulphuric acid; in the latter case, the solution on cooling deposits a white powder, whilst the sugar remains dissolved. The product of the decomposition of the glucoside is soluble in alcohol and also in boiling water, being deposited again as the solution cools; it has not been examined.

When commercial podophyllin is fused with potash and treated in the usual way, it yields a small quantity of a product which seems to contain hydroxysalicylic acid, parahydroxybenzoic acid, and pyrocatechol.

The author considers that the glucoside in podophyllin resembles convolvulin and turpethin.

Nerium Odorum. H. G. Greenish. (*Pharm. Journ.*, 3rd series, xi., 873.) *Nerium odorum*, the sweet-scented oleander, is much cultivated in India for its flowers, which are used in certain religious ceremonies by the Hindoos. All parts of the plant, especially the root, are recognised by the natives as poisonous; yet it is prescribed in leprosy and other diseases. The root has a greyish wrinkled bark, which is internally yellowish green, and covers a soft yellowish grey wood. The bark is composed of about 10 rows of cork cells, followed by parenchymatous tissue, which is traversed longitudinally by numerous laticiferous vessels, and is free from bast fibres. On treating sections with iodine and zinc chloride, the parenchymatous cells are coloured blue and the dried latex absorbs iodine, assuming a yellow colour. The wood consists of the usual elements, wood-cells and vessels which are thin-walled and of small diameter, and medullary rays composed of a single row of parenchymatous cells loaded with starch grains. A sample of bark examined was found to be internally and externally of a grey-brown colour, bearing some resemblance to mezereon bark, from which, however, its short fracture at once distinguished it; the parenchyma contained small starch grains and crystals of calcium oxalate, also numerous groups of bast fibres arranged in a ring around the wood.

The author's chemical examination of this bark shows that it contains two closely allied non-nitrogenous, bitter principles, probably glucosides, both possessing the characters of powerful cardiac poisons. These he proposes to name *neriodorein* and *neriodorin*. The process by which these principles were extracted is fully described in the paper.

Neriodorein is a pale lemon-yellow amorphous powder, of an in-

tensely bitter taste, followed by a numbing sensation lasting a considerable time. It is insoluble in petroleum spirit, ether, benzol, chloroform, carbon bisulphide, amyl-alcohol, and acetic ether, but is easily soluble in cold water and in alcohol; if contaminated with small quantities of neriodorin, it becomes extremely hygroscopic. The dry powder yields with sulphuric acid a reddish brown colour, at the edges violet, passing gradually to a dirty yellowish brown and green; with sulphuric acid and cane sugar, at first the same colour, turning violet-blue; with nitric acid added to the sulphuric acid solution, yellow; and with Froehde's reagent a deep dirty violet colour. An aqueous solution (1 : 100) is neutral to test paper, and turns slightly brown on the addition of ferric chloride. Potassio-mercuric iodide, copper acetate, neutral lead acetate, and basic lead acetate produced no precipitates; but if the last-named reagent be succeeded by a drop of ammonia solution, a bulky gelatinous precipitate is formed. Tannic acid throws down a yellowish precipitate. Fehling's copper solution is reduced on boiling with the aqueous solution of neriodorein; but the ease with which the latter dissolves in absolute alcohol and in a solution of 1 vol. chloroform in 4 vols. of absolute alcohol, proves the reaction not to be due to any sugar present as impurity, although that substance was detected in the root.

Neriodorin is a clear yellow, transparent, tenacious, varnish-like mass, not pulverizable, easily soluble in chloroform, very difficultly soluble in cold water, but imparting to it its bitter taste; insoluble in petroleum spirit, benzol, and carbon bisulphide; very slightly soluble in ether, and rather readily soluble in alcohol. Its behaviour to reagents is very similar to that of the preceding principle, except that a cold saturated aqueous solution is coloured a deep reddish brown by ferric chloride, the colour being discharged by acids and alkalies; and yields, with basic lead acetate, gelatinous flocks, and with potassio-mercuric iodide a copious whitish precipitate.

Sophisticated Rose Petals. T. E. Greenish. (*Pharm. Journ.*, 3rd series, xi., 733.) Rose petals artificially coloured with rosaniline have lately occurred in the market, and may be readily recognised by a test recently recommended in the *Ber. der deutsch. chem. Ges.* (xiii., 2,263) for the detection of rosanilin in red wines.

To carry out this process, a tincture of the petals in proof spirit is prepared of a strength of about 1 in 8. The deep crimson colour of the tincture contrasts strongly with that made from natural rose petals, which has but a slight colour.

Two ounces of this tincture are made alkaline by ammonia, a few

threads of fine white wool added, and the whole boiled until the spirit and ammonia are dissipated. The wool is taken out, washed, and heated gently in a test tube with a small quantity of a 10 per cent. solution of caustic potash; the resulting brown solution is cooled, and diluted with half its volume of alcohol. A quantity of ether equal in volume to the mixture is added, and the whole well shaken. The ether rises to the surface, is removed, and on the addition of acetic acid the pink colour of acetate of rosanilin is at once produced and instantly discharged by the action of nascent hydrogen.

Iva (*Achillæa Moschata*). Dr. v. Planta-Reichenau. (*Pharmaceutisches Handelsblatt*, 1880, No. 23.) The iva plant, *Achillæa moschata*, grows in Switzerland, at an altitude of 1,500 to 3,400 metres, and is used as a nervine tonic and as a febrifuge. The leaves, on crushing, emit a characteristic musk-like odour. The author's examination of this plant shows the presence of the following constituents:—

1. *Ivaol*, $C_{24}H_{40}O_2$, a clear pale-yellow essential oil of a pleasant aromatic odour, and a warm bitter taste faintly resembling that of oil of peppermint.

2. *Ivain*, $C_{24}H_{42}O_3$, a yellow substance of a peculiar odour and intensely bitter taste, insoluble in water, but soluble in alcohol.

3. *Achillein*, $C_{20}H_{38}N_2O_{15}$, a bitter principle soluble in water, but difficultly soluble in absolute alcohol; also occurring in *Achillæa millefolium*.

4. *Moschatin*, $C_9H_{27}NO_7$, an odorous principle of an aromatic bitter taste, somewhat soluble in alcohol, but almost insoluble in water.

5. *Stearic Acid*.

According to M. Bernhard, this drug is best administered in the form of a tincture or of a wine.

Mikania Guaco as a Remedy for Snake Bite. (*Pharm. Journ.*, 3rd series, xi., 369.) In South America, under the name of "guaco," several plants enjoy a considerable reputation as remedies against snake bites. Most of them are species of *Aristolochia*, but one, the *Mikania Guaco*, is a composite plant. Notwithstanding this reputation, very little trustworthy evidence has been published as to the real efficacy of any of them, and an attempt made by Dr. Schomburgk a few years since to introduce the *Mikania Guaco* into South Australia, with a view of clearing up the doubt, does not appear to have led to a definite result. In a letter, however, recently received by the Directors of the Royal Gardens at Kew, from Mr. R.

B. White, of La Salada, New Granada, the writer gives his personal testimony as to the value of the remedy, together with some other information respecting it.

The writer says that the *Mikania Guaco* is the true "guaco," and forms the basis of all the preparations of the snake bite doctors of the district. There are two varieties, one with green stems, the other, called "morado," with purple, the latter being most prized. There are several species of snakes in the country whose bite is deemed mortal, some of them killing in a very few hours; but the guaco, properly and promptly administered, is a cure for the bite of the most venomous.

In cases of snake bite, when the guaco leaves can be obtained fresh, an infusion in sugar water is made in the proportion of one leaf to a large cupful, and this quantity is given hot every hour. It is said to stop the vomiting usually occurring. The leaves are also preserved by bruising and placing them in alcohol, and of the tincture thus formed a teaspoonful is administered every half-hour, for an hour and a half, and then every hour, gradually diminishing the dose. Hot poultices of the bruised leaves and stem of the plant are applied to the wound, taking care not to use sufficient heat to drive off the volatile principles of the plant. If there be swelling and pain, the limb is fomented with hot water to which some tincture of guaco has been added.

The *Mikania Guaco* is described as growing from seeds in any good soil where there is a temperature of 24–25° C.; and it would appear to be a plant deserving of physiological and chemical experiments to determine its true character. It is worthy of note that it was at one time said to be the source of condurango.

Note on *Mikania Guaco*. J. G. Baker. (*Pharm. Journ.*, 3rd series, xi., 471.) *Mikania Guaco* is a form of a plant widely diffused in Tropical America, which is known under a great many different botanical names. It is the *Eupatorium amarum* of Vahl; *Eupatorium parviflorum* of Aublet's "Guiana," tab. 315; *E. vincoefolium* of Lamarck, in the French "Encyclopédie"; *Mikania amara* of Willdenow and De Candolle; *Mikania Huaco* of De Bieux; *M. argyrostigma* of Miquel's "Stirpes Surinamenses," tab. 55; and *M. Guaco* and *Tafallana* of H. B. K. and De Candolle. Under the name of *Mikania Guaco* there are figures in H. B. K., "Pl. Equin.," tab. 105, and Descourtilz's "Medical Flora of the Antilles," tab. 197, and under the name of *M. amara*, var. *Guaco*, in the author's "Monograph of the Brazilian Compositæ," tab. 66. It ranges from Panama and Nicaragua to Peru and Central Brazil.

Pereiro Bark. Dr. O. Hesse. (*Liebig's Annalen*, ccii., 141-149, and *Journ. Chem. Soc.*, 1880, 675.) An extract from this bark is used in Brazil as a febrifuge. The bark is obtained, according to Peckolt, from *Geissospermum velosii*, whilst, according to Baillon, it is from *Geissospermum læve*. Gros (*Repert. Pharm.*, lxxvi., 32) finds it to contain an alkaloid, which is styled pereirine; whilst Peretti (*Journ. Chim. Med.*, xxvi., 162) concludes that it contains other alkaloids. The author has obtained from this bark two alkaloids; viz., geissospermine and pereirine. The alcoholic extract of the bark is treated with soda, and then extracted with ether. The ethereal extract is subsequently treated with acetic acid, and the dark-brown acetic acid solution is shaken up with ammonia and ether. Geissospermine then separates out, and the pereirine remains dissolved in the ether, and is obtained by evaporating the ethereal solution.

Geissospermine, $C_{19}H_{24}N_2O_3 + H_2O$, crystallizes from alcohol in small white prisms, the ends of which are surmounted by domes. It dissolves easily in hot, and sparingly in cold alcohol, the solution having an alkaline reaction. It is insoluble in ether and water. It dissolves easily in dilute acids, and is precipitated from these solutions by alkalis. Concentrated nitric acid gives a purple-red coloration, which, when heated, becomes orange-yellow. Its solution in pure concentrated sulphuric acid is at first colourless, it however becomes blue very soon, and then the colour fades again; in presence of molybdic acid the blue is produced at once, and is permanent. When heated with soda lime, a body is formed subliming in leaflets, easily soluble in ether, and giving a blue coloration with sulphuric acid solution of molybdic acid, but no coloration with nitric acid. It undergoes a change when heated to 160° .

Its hydrochloride is amorphous; the platinochloride forms an amorphous, light yellow precipitate, which loses water at 180° , and then has the composition $(C_{19}H_{24}N_2O_3HCl)_3PtCl_4$. The aurochloride is a dirty brown amorphous body. Its oxalate crystallizes from alcohol as a white powder, consisting of microscopic needles. The sulphate crystallizes from alcohol in stellate grouped white needles, is easily soluble in water and hot alcohol, sparingly in cold alcohol, and insoluble in ether. Dried at 100° , it has the formula $(C_{19}H_{24}N_2O_3)_2H_2SO_4$. By means of the aqueous solution of the sulphate, the author has tested the delicacy of its reactions with several bodies, and finds that the alkaloid is most easily precipitated by ammonia and soda, whereas the reaction with phosphotungstic acid is not very delicate.

Pereirine, $C_{19}H_{24}N_2O$.—This alkaloid, obtained as described above, is purified by dissolving it in acetic acid and boiling with animal charcoal; from the yellow solution obtained, ammonia gives a white amorphous precipitate, which, when air-dried, is a greyish-white powder. It is easily soluble in alcohol, ether, and chloroform; also in dilute acids, from which latter it is precipitated by alkalies. Concentrated sulphuric acid dissolves it with a violet-red colour, and nitric acid with a purple-red. It melts at 124° to a red mass. Its sulphate and hydrochloride are amorphous, and easily soluble in alcohol. Its platinochloride is a yellowish grey amorphous precipitate, having the composition $(C_{19}H_{24}N_2O \cdot HCl)_2PtCl_4 + 4H_2O$.

The Constituents of Damiana. H. B. Parsons. (*New Remedies*, September, 1880.) Analyses of damiana (*Turnera Aphrodisiaca*) show it to have the following composition:—

| | |
|---------------------------------------|-------------|
| Moisture, at $115-125^\circ C$. | 9.06 |
| Ash, by combustion | 8.37 |
| Chlorophyll, Soft Resin, Volatile Oil | 8.06 |
| Hard, brown Resin. | 6.89 |
| Sugar, Colour, and Extractive matter | 6.42 |
| Tannin | 8.46 |
| Bitter Substance | 7.08 |
| Gum | 18.60 |
| Starch Isomers | 6.15 |
| Acid and Alkali extracts | 10.02 |
| Albuminoids | 14.88 |
| Cellulose | 5.03 |
| | <hr/> 98.42 |

The author believes the hard resin to be medicinally inactive, but considers it very probable that to the soft resin may be attributed many of the unpleasant irritant effects following the administration of alcoholic extracts of damiana.

The volatile oil does not exceed 0.2 per cent. It was not further examined, but in the author's opinion it appeared to resemble oil of turpentine.

The bitter substance is an amorphous, light brown, uncrystallizable solid, containing no nitrogen, and apparently not a glucoside. Its bitterness is not unpleasant nor very persistent. Water and alcohol freely dissolve this bitter extractive, but it is insoluble in ether, chloroform, benzol, petroleum naphtha, and carbon bisulphide. Repeated experiments failed to separate this substance in a crystalline form, and thorough treatment with animal charcoal

did not deprive it of colour; it is not precipitated by acetate or basic acetate of lead, or by any other of the ordinary reagents.

The author believes that this bitter substance is a true tonic of especial value to dyspeptic patients. For their use it should not be administered as fluid extract or tincture (both of which contain the objectionable irritant resins), but rather as an infusion or decoction. He has seen very marked good effects in three cases where the persons experimented upon were constantly troubled with disordered stomach and attendant sick headaches; in each of these cases the faithful use of damiana "tea" twice a day has resulted in apparent cure, after about one to two months' experimentation.

The tannin gives a greenish brown colour with ferric salts, but possesses no marked astringency.

From what has been stated, it seems probable that alcoholic preparations may be irritating in many cases because they contain the soft resin, and that aqueous extracts are probably tonic because they contain the bitter extractive. At the same time, the alcoholic extracts may possibly be more useful when they can be borne by the stomach. Possibly, also, the reputed aphrodisiac virtues of damiana may be due to the single or conjoined action of the soft (and probably irritating) resin, and of the bitter extractive.

Note on the History of Saffron. C. B. Allen. (From a paper read before the Pharmaceutical Society, December 1st, 1880, and published in the *Pharm. Journ.*, 3rd series, xi., 449.) The historical data collected by the author lead him to infer that saffron may possibly have been known to the Celts before the advent of Cæsar, and that it is in the highest degree probable that it was originally introduced by the Phœnicians, and bartered them for tin to the western barbarians. The latter, from their love for fine colours, were likely in the first instance to be attracted by it on account of the stain it produces, while subsequent and closer intercourse with the Phœnicians, would doubtless have taught them to use it as they—the Phœnicians—used it, in the form of a condiment. This use has probably descended from generation to generation, and continues to exist at the present day in several European countries; in England notably in Cornwall.

The Uses of Saffron in the Pharmacopœia. E. M. Holmes. (From a paper read before the Pharmaceutical Society, December 1st, 1880, and published in the *Pharm. Journ.*, 3rd series, xi., 449.) According to the authors of "*Pharmacographia*," and of several other well-known text books of materia medica and botany, saffron is of no value as a medicinal agent, and only retains its place in the

materia medica as a colouring and flavouring agent. The author of the present paper points out that in such preparations as decoctum aloes co., pil. aloes cum myrrha, tinct. rhei, and tinct. cinchonæ co., the presence of saffron can hardly be accounted for on the ground that it is a colouring and flavouring agent, and that its use in these preparations must therefore be traced to another source. These and many other valuable preparations of the Pharmacopœia, when first introduced, were intended to imitate or supplant certain patent medicines or proprietary articles which the medical practitioner of former times found advantageous to use, just as those of the present day have adopted chlorodyne, or liq. bismuthi. Thus, decoctum aloes replaces baume de vie, or balsam of life; pil. aloes et myrrhæ is still called pil. rufi; pulvis cretæ aromaticus may be traced back through the names of confectio cardiaca, from the London Pharmacopœia of 1745, to that of 1724, where it occurs as Raleigh's electuary, or confectio Raleighana, with over forty ingredients; tinct. cinchonæ co. is still known as Huxham's tincture of bark in England, Belgium, and Spain; and tinct. opii ammoniata as paregoric elixir in Scotland. The use of saffron in some of the above preparations, such as pil. rufi, may be traced back to the time of Culpepper, who lived between 1616 and 1654, and indeed to the influence of astrology on medicine. He and some of his contemporaries, reflecting the belief of preceding generations, speak of saffron as a stimulant, and attribute to it various other medicinal virtues.

In the author's opinion, saffron might in future Pharmacopœias be with advantage omitted from most of the preparations for which it is now used, and retained only in the form of a tincture or syrup, or preferably, a glycerole.

A Poisonous Star Anise. Prof. T. Husemann. (*Pharmaceut. Zeitung*, 1880, 530.) In a communication to the *Pharm. Weekblad*, A. J. C. Geerts, of Yokohama, calls attention to a poisonous fruit closely allied to star anise, which, though described in some works as poisonous, or at least suspicious, has hitherto received hardly any attention from pharmacologists and toxicologists. The fruit in question is derived from *Illicium religiosum*, Sieb., a Japanese tree which has been confounded by several writers with the true *Illicium anisatum*. The toxic properties of the former are well marked. The prevailing notion that the two plants are mere varieties of the same species, owing their differences to climatic influences, is shown by the author to be untenable, since the Japanese *Illicium* bears poisonous fruit when cultivated in China,

whereas the Cochin China *Illicium* undergoes no change in the properties of the fruit when grown in that country. The two must, therefore, be regarded as distinct species. A preliminary examination of the Japanese fruit has revealed the absence of an alkaloid.

The following distinguishing features between the two fruits are mentioned by Geerts:—The ends of the carpels of the Japanese fruit are pointed and curved upwards, whilst the apex of the star anise is mostly pressed in, and extended horizontally. The former, moreover, are more woody, rougher on the surface, as well as more compressed and more boat-shaped, than the rosette-like star anise, and enclose much brighter seeds of a yellowish colour. The odour and taste of the Japanese drug remind of camphor or bay berries rather than of anise.

Star Anise. E. M. Holmes. (*Pharm. Journ.*, 3rd series, xi., 489.) Recent papers on a poisonous variety of star anise (see the preceding abstract) induced the author to make a comparative examination of the fruits of different species of *Illicium*. He finds that there is so great a similarity in the leaves and fruits of different species, that it is not at all surprising that Linnæus should have confounded the Japanese and Chinese plants; and that, moreover, the taste of the fruits, and the number of carpels of which they are composed, form the best guide to distinguish the species.

Although only the Chinese and Japanese star anise have occurred in English commerce, there are two other kinds which appear to be articles of trade in the East; and these also, in view of the possibility of their being exported at some future time to this country as substitutes for the true article, are included in the author's description.

The fruit of *Illicium religiosum*, known in Japan as, *skimi*, *somo*, *skimi* or *fanna skimi*, and in China under the name of *ao-woo-soo*, is described as about one-third less in diameter than the Chinese drug, and a few only of the carpels are generally developed to maturity. The curve or depression on the ventral suture near the apex is deeper and shorter, and hence the very short beak appears more erect than in the Chinese drug. Neither the pericarp nor the seed has any taste of anise, but possesses a very faint taste and odour like the oil of *Laurus nobilis*, or distantly resembling the odour of cubebs. The number of carpels is eight, as in the Chinese anise.

The seeds vary in thickness according to the degree of ripeness, as in the other species.

Illicium parviflorum, indigenous to Georgia and Carolina. Carpels eight, short beaked. Taste resembling sassafras.

Illicium floridanum, indigenous to the coast of Florida. Taste like anise. In Alabama the leaves are reputed to be poisonous, and the plant has hence acquired the name of poison bay.

Illicium Griffithii, native of East Bengal. Carpels 13, resembling in colour star anise, but darker at the ventral and dorsal sutures, and with lateral scars; beak short, incurved; terminal depression well marked. Taste, at first none, but shortly bitter, with some acidity, and a flavour between that of cubebs and bay leaves.

Illicium majus, native of the Thounng Gain range in Tenasserim, at an altitude of 5,500 feet. Carpels 11-13; terminal depression longer and shallower, and beak short and less incurved, than in the preceding. Taste strongly resembling mace, not bitter.

The fruit of the Japanese anise when wetted and laid on a piece of blue paper, reddens it immediately and strongly, while the Chinese star anise causes only a very faint red coloration. The fruits of *I. Griffithii* and *I. majus* produce no such reaction.

Woodcuts of the fruits of *Illicium anisatum*, *I. religiosum*, *I. Griffithii*, and *I. majus* illustrate the author's descriptions.

Adulterated Star Anise. Dr. A. Langfurth. (*Pharmaceut. Zeitung*, 1881, 170.) The author received for examination a sample of star anise purchased at Altona, an infusion of which had produced serious symptoms of poisoning in two persons. He found it to contain 30 per cent. of skimi fruit (*Illicium religiosum*), one half of which agreed with the characters described by Prof. Husemann (see this volume, p. 161), while the other half consisted of more elongated carpels, almost without seed and scarcely opened. He describes the fruit stalk of the skimi fruit examined by him as clavate towards the fruit, strongly wrinkled and without articulations, while those of the true star anise are of uniform thickness, and provided at each end with a prominent articulation. In doubtful fruits, in which these distinguishing features are not so well marked, the odour and taste afford the best means of recognition; for if the Skimi fruit be crushed in a mortar, it gives off an odour resembling a mixture of oil of cajuput and sassafras, entirely different from that of true star anise.

Illicium Religiosum, Sieb. J. F. Eykman. (Abstract of a translation from "Mittheilungen der Deutschen Gesellschaft für Natur-und Völkerkunde Ostasiens," vol. xxiii. (Yokohama, 1881), published in the *Pharm. Journ.*, 3rd series, xi., 1046-1050, and 1066-1068.) This exhaustive memoir is divided into two parts, the first of which contains an account of the author's investigation of the poisonous principle, and the essential and fixed oils of *Illicium*

religiosum, while the second part is devoted to a consideration of the botanical relations of this species to *Illicium anisatum*.

The differences found to exist between the essential oil of *Illicium religiosum* and other oils containing anethol used in medicine—such as ordinary oil of anise, oil of true star anise (*Illicium anisatum*), and oil of fennel—are shown in the following table :—

| | Ol. Anisi vulgaris. | Oleum Feniculi. | Ol. Anisi stellati. | Ol. Illicii religiosi. |
|--|--|---|---|---|
| Constituents . | Chiefly solid and liquid anethol. | Small quantity of terpene boiling at 190° C., and liquid and solid anethol. | Chiefly solid and liquid anethol. | Rather much of a terpene boiling at 178° to 176° C. ; liquid anethol boiling at 232° to 233° C. |
| Melting Point . | + 6° to 18° C. | — 2° to + 18° C. | About 0° C. | Not solid when cooled to 20° C. |
| Specific Gravity | About 0.908. | 0.94 to 0.998. | 0.978. | 1.006. |
| Molecular Rotation | 0° to + 0.5°. | + 13° to + 19.6°. | 0° to — 0.4. | — 8.6°. |
| Alcoholic Hydrochloric Acid | Colourless, afterwards reddish, then pale red. | Colourless. | Colourless. | Colourless, afterwards blue. |
| Chloral Reagent | Colourless, afterwards yellow and brownish. | Colourless, then beautiful red. | Colourless, then beautiful red. | Colourless, afterwards dirty brown-yellow. |
| Ammoniacal Silver Solution | In 24 hours no reduction. | Like ol. anisi vulgaris. | Like ol. anisi vulgaris. | Reduction in a few hours. |
| Hager's Reaction | In alcohol, a portion of the sulphuric acid and oil mixture remains undissolved as a thick mass adhering to the sides of the tube. | Mixture of oil, sulphuric acid, and alcohol is perfectly clear. | Like ol. anisi vulgaris. | Mixture is nearly clear; separation of a little reddish white deposit. |
| 10 drops of oil, with 60 drops of ether and about 0.150 gram of sodium | Colourless; after 4 hours the mixture nearly colourless; deposit yellowish white. | — | Colourless; after 4 hours liquid, and deposit yellow. | Colourless; quickly bluish; after 4 hours liquid pale yellow, deposit yellow. |

The essential oil of "shikimi" (sikimi, also skimi)—names used for *Illicium religiosum*—mixes in all proportions with absolute alcohol, chloroform, benzol, glacial acetic acid, carbon bisulphide, and fixed oils. In petroleum spirit (b. p. up to 58° C.) it is somewhat difficultly soluble, and it requires of alcohol of 78.5 per cent. for complete solution about 3½ volumes.

The fixed oil expressed from shikimi seed amounts to upwards of

30 per cent. It is a clear thick liquid of a pale yellow colour, of 0.919 sp. gr., and without any marked odour. It is soluble in all proportions in petroleum spirit, chloroform, ether, benzol, and carbon bisulphide; very slightly in cold absolute alcohol and glacial acetic acid, in about 15 parts of boiling absolute alcohol and 2.5 parts of boiling glacial acetic acid.

By experiments on dogs it was demonstrated that neither the essential nor the fatty oil represent or contain the poisonous principle of the Japanese star anise. After various attempts, the author succeeded in isolating this principle from the seed by the following process:—

2½ kilograms of the seeds were freed from fat by petroleum spirit, and then exhausted by percolation with alcohol of 75 per cent. containing a little acetic acid. The percolate was evaporated, the residual extract warmed with glacial acetic acid, and then gradually mixed with successive portions of chloroform until the latter caused no further separation. The chloroform solution, which was only faintly coloured yellow, was filtered off, and the operation was repeated several times upon the residue. From the united liquids the chloroform was distilled off, and the acetic acid evaporated; there remained an amorphous yellow residue, which physiological experiment showed to contain the poisonous principle. For the purpose of purification, this amorphous substance was treated with hydrochloric acid and placed in an exsiccator, when in the course of twenty-four hours wart-like, crystalline agglomerations separated, which were then repeatedly crystallized from boiling water. Thus obtained, the crystals were colourless, hard, heavy, difficultly soluble in cold water, more soluble in hot water, ether, and chloroform, easily in alcohol and glacial acetic acid, and insoluble in petroleum spirit. Alkalies did not increase their solubility in water, and the aqueous solution had no effect upon Fehling's solution. The crystals were found to fuse at 175° C. If heated more strongly they became red-brown, and diffused a peculiar odour, and finally carbonized without leaving the least fixed residue. A small quantity submitted to sublimation between two watch glasses yielded a drop of an oily sublimate, which did not crystallize from aqueous solution. The aqueous solution gave, with iodide of mercury and potassium, a faint turbidity which disappeared with excess. The solution in chloroform left on evaporation only an amorphous residue. No nitrogen could be detected in the small quantity available for testing.

Under the microscope the crystals appear arranged in stellate groups, besides which some prismatic forms are observed.

Experiments on dogs have satisfied the author that the crystallizable substance isolated and described by him, and provisionally named "sikimine," is undoubtedly the poisonous principle—though perhaps not yet in a perfectly pure state—of *Illicium religiosum*.

The second part of the memoir is mainly a reproduction of previous botanical literature of *Illicium religiosum* and *Illicium anisatum*. It concludes with the following summary of characters for distinguishing the shikimi fruit from the true anise:—

| True Star Anise. | Shikimi Fruit. |
|---|--|
| <p><i>Taste sweet, anise-like; odour faintly of anise.</i></p> <p>Somewhat larger than "shikimi" fruits. Surface more resembling cork. Beak short, horizontal, or slightly bent upwards, pointing outwards. Carpels less woody, shrivelled in one upon another, and wrinkled. Seed mostly dark brown with rounded apex.</p> | <p><i>Disagreeable taste, not sweet or like anise. Smell not like anise, but faintly resembling laurel, clove, and nutmeg.</i></p> <p>Somewhat smaller than true anise. Surface more shining, red-brown. Beak thin, frequently bent strongly upwards or crooked backwards. Carpels more woody, much shrunk in one upon another, wrinkled. Seed mostly yellow-brown, with a stout keel and a raised apex.</p> |

The Root of Hydrangea Arborescens. J. Baur. (*Amer. Journ. of Pharm.*, 1881, 157.) This author gives an account of the chemical examination of this root, showing it to contain a resin soluble in ether, a resin insoluble in ether, tannin, gum, sugar, colouring matter, 4.33 per cent. of ash, and a crystalline compound the nature of which was not determined. Indications were also obtained of the presence of an alkaloid.

"Wanika," a New African Arrow Poison: its Composition and Properties. A. W. Gerrard. (*Pharm. Journ.*, 3rd series, xi., 833–835.) The arrow poison reported upon in this paper was obtained from Africa, Livingstone's territory, and is believed by Dr. Ringer to be the same as that investigated by Prof. Fraser in 1870.

The author's chemical examination of this substance affords no evidence of the presence of an alkaloid, but establishes the presence of a poisonous glucoside. He is disinclined, at present, to name this glucoside as a definite principle, as he is informed that no fewer than eleven different plants enter into the composition of the wanika.

The results of physiological experiments conducted by Dr.

Ringer, both with the extract and the glucoside, are given in the paper.

Smilax Glycophylla. Dr. C. R. A. Wright and E. H. Rennie. (From a paper read before the Chemical Society, March 17th, 1881, and published in the Society's Journal for May, 1881, 237.) The leaves of *Smilax glycophylla* have long been used by herbalists and others in Australia as a remedy for scurvy and allied diseases, but no investigation of the sweet principle contained in them appears to have been hitherto made. The authors report that they have isolated from them a sweet principle of the formula $C_{13}H_{14}O_6$, crystallizing with 2 or 3 molecules of water, for which they suggest provisionally the name *glycyphyllin*. It is dissimilar from the active principle of sarsaparilla (containing less hydrogen than the latter), and also from glycyrrhizin, which it somewhat resembles in taste. By fusing it with potash, acidifying the fused mass, and extracting with ether, it yielded a crystallizable acid of the formula $C_9H_{10}O_3$, which on heating with soda-lime evolved an odour resembling that of phenol; it gave no colour reaction with ferric chloride.

The sweet principle was obtained by treating the aqueous extract of the leaves with alcohol to precipitate albuminoids, filtering, removing the alcohol by distillation, then shaking the filtered residue repeatedly with ether, and allowing the ethereal solutions to evaporate.

Prinos Verticillatus. L. C. Collier. (From an inaugural essay published in *Amer. Journ. of Pharm.*, Sept., 1880.) The paper contains full details of a chemical examination of the bark of *prinos verticillatus*, establishing the presence therein of the following constituents:—Wax, resin, chlorophyll, tannin, glucose, cane sugar, gum, starch, and a bitter, amorphous principle soluble in water. No indications whatever were obtained of the presence of alkaloidal bodies. The aqueous solution of the bitter principle was found to form precipitates with platinum perchloride, silver nitrate, stannous chloride, mercuric chloride, potassium antimoniate, and concentrated mineral acids.

Cape Tea. H. G. Greenish. (*Journ. Chem. Soc.*, from *Pharm. Journ.*, 3rd series, xi., 549–551, and 569–573.) This name is given to a drug (also called “Honig-thee”) used at the Cape of Good Hope as a substitute for tea. It consists of the stalks and leaves of *Cyclopia longifolia*, and other species of the same genus (Order, *Leguminosae*). Four species are described by the author; viz., *C. longifolia*, *C. brachypoda*, *C. genistoides*, and

O. Vogelii; and in the case of the first two the description includes an account of the microscopical characters of transverse sections, illustrated by woodcuts.

Chemical Examination.—By treating a concentrated aqueous decoction of the stalk and leaves with neutral lead acetate, a dark brown precipitate is obtained; a further precipitate of a lighter colour is obtained by treating the filtrate with basic lead acetate, and the filtrate from this precipitate yields a bright yellow precipitate with potash. The first precipitate was freed from lead by suspension in water and treatment with sulphuretted hydrogen, the solution evaporated to dryness, and the residue exhausted with alcohol. From the alcoholic solution a pale reddish substance was deposited. On mixing the mother-liquor with ether, a further quantity of the red compound was obtained. This compound gave a rose-red coloration when boiled with hydrochloric acid; it is very hygroscopic. The analysis of the two preparations gives results corresponding with the formulæ—



For the investigation of this body a larger quantity of it was prepared by digesting an aqueous decoction with lead hydrate, suspending the precipitate in alcohol (50 per cent.), decomposing it as above, concentrating the solution under reduced pressure, and evaporating in a vacuum to a syrupy consistency. The residue was treated with absolute alcohol, and the solution filtered from insoluble matter. The filtrate (200 c.c.) was fractionally precipitated with ether (200, 300, and 400 c.c.), when the red compound, *cyclopin*, separated; the last fraction, being the purest, was analysed, and gave results corresponding with the formula $C_{25}H_{28}O_{13} \cdot H_2O$. The differences in the composition may be attributed to the hygroscopic nature of the substance when boiled with dilute acids. *Cyclopin* assumes a bright red colour, and, on standing, the solution deposits red flakes of *cyclopia-red*, $C_{19}H_{23}O_{10}$; grape sugar is also formed: it is therefore a glucoside. *Cyclopin* is insoluble in benzene, ether, light petroleum, chloroform, and carbon bisulphide, but very soluble in water. It dissolves in concentrated sulphuric acid, with a red-brown colour. With Fröhde's reagent it gives a violet-red coloration, and with potash a brown-red solution is obtained with green fluorescence. It gives precipitates with copper, lead, and silver solutions; in neutral solutions ferric chloride gives an olive-green colour; in presence of hydrochloric acid a yellowish, and of ammonia, a brown. Potassium dichromate and hydrochloric

acid give a brownish red colour. Cyclopia-red is sparingly soluble in water, ether, light petroleum, chloroform, and benzene; but when freshly precipitated, it is readily soluble in alcohol. With alkalis it gives wine-red solutions, and with ferric chloride a brown colour. In presence of ammonia, it gives violet precipitates with calcium chloride and alum.

Cyclopin does not yield quinone when distilled with manganese dioxide and sulphuric acid, nor do the other isolated substances. Stenhouse, however (*Annalen*, xxvii., 257), obtained that body from a decoction of the leaves of *Cyclopia latifolia*, prepared with milk of lime. Cyclopin, however, seems to be analogous to the tannic acids of the cinchona barks, in that it splits up into sugar and a red compound on treatment with dilute acids; but it differs from them by not precipitating gelatin and tartar emetic solutions. On concentrating the ether-alcohol filtrate obtained in the preparation of cyclopin, it yielded a crop of sulphur-yellow acicular crystals of cyclopiafluorescin, $C_{14}H_{18}O_3$, insoluble in carbon bisulphide, alcohol, and ether, soluble in water and in alkalis, with a yellow colour and green fluorescence. With sulphuric acid and Fröhde's reagent, it gives yellow colours; concentrated nitric acid gives a yellow colour, changing to black, and finally brown. Ferric chloride gives a green colour, changing to brown on heating; excess of nitric acid added to the aqueous solution, gives a dark-red colour, changing to yellow; copper acetate, a grey precipitate; and potassium dichromate and hydrochloric acid a dark brown-red. The filtrate from the lead hydrate, when treated with absolute alcohol, yielded a yellow precipitate, readily soluble in water; the aqueous solution gave a brown coloration with ferric chloride, and a precipitate with barium nitrate soluble in nitric acid. The alcoholic filtrate gave a yellow precipitate with baryta-water. These bodies are probably organic acids not precipitated by lead.

The residue obtained after treating the syrupy extract with alcohol in the preparation of cyclopin, is a pale-red powder, readily soluble in water, sparingly in alcohol, and of the formula $C_{25}H_{30}O_{16}$, which, written $C_{25}H_{28}O_{15}.H_2O$, shows it to be *oxycyclopin*. Like cyclopin it is a glucoside, and yields oxycyclopia-red, $C_{19}H_{22}O_{13}$, and grape sugar when boiled with dilute acids. In their reactions these bodies resemble cyclopin and cyclopia-red.

The residue of the leaves, after maceration with water, yielded to absolute alcohol chlorophyll, a soft resin, a fat, and a substance

probably belonging to the class of phlobaphenes. The residue gives a dark-brown infusion with potash.

A quantitative analysis of the leaves shows the following comparison with tea from *Thea* :—

| | Tea from <i>Thea</i> . | Tea from <i>Cyclopin</i> . |
|---------------------------------|------------------------|----------------------------|
| Moisture | 8.0 - 12.0 | 20.4 |
| Ash | 4.5 - 5.5 | 8.7 |
| Substances soluble in water . . | 80.0 - 88.0 | 80.4 |
| Total Nitrogen. | 4.15 - 6.72 | 2.29 |
| Mucilaginous substances . . | 5.3 - 6.4 | (?) |

Metarabin (?).—After treating the leaves twice for thirty-six hours with separate quantities of soda solution (0.5 per cent.), and precipitating the two infusions, 6.51 per cent., metarabin (?) was obtained. The very small quantities of nitrogen contained in the Cape tea show that it has little or no nourishing properties. Owing to the small quantity of substance at the author's disposal, many of the above results require confirmation.

Cape Tea. A. H. Church. (From *Journ. Chem. Soc.*, 1881, 443.) The author points out that *Cyclopia fluorescin* (see preceding abstract) had previously been discovered by himself, under the name of *cyclopic acid*, in *Cyclopia Vogelii*, a plant used by the Boers as a substitute for tea (*Chem. News*, xxii., 2). He assigns to it either the formula $C_7H_8O_4$, or $C_{14}H_{18}O_8$, the latter agreeing more closely with the results of analysis. The acid yields highly fluorescent solution with alkalies.

Mancona Bark. MM. Sée and Rochfontaine. (*Lancet*, 1880, 1011.) The authors have investigated the action of this drug on the heart and respiratory organs. They report that its active principle, erythrophloecin, increases the vascular tension, and at first slackens the pulse and action of the lungs. Subsequently, however, the respiratory movements are decidedly accelerated, and in fatal cases they persist, even after the cessation of the heart's action.

Previous notices of this bark, which is also known as "sassy bark" and "casca bark" will be found in the *Year-Book of Pharmacy*, 1876, p. 246, and 1877, p. 170.

Hedeoma Pulegiodes (American Pennyroyal). (*Nature*, 1880, 463.) The leaves of this plant when strewed about a room are said to be an excellent means of keeping mosquitoes away, while the essential oil, rubbed on the skin, affords an efficient protection

against an attack by these insects. The writer thinks that the oil of *Mentha pulegium* should be tried for the same purpose, and considers it not unlikely that it may have a similar effect.

Dita Bark. Dr. O. Hesse. (*Liebig's Annalen*, cccii., 144.) The author has continued his researches on this drug, the bark of *Alstonia scholaris*, and now reports that in addition to the alkaloid ditamine, previously isolated and described by him, he has separated from this bark two other bases, echitamine and echitenine.

Ditamine exists in the bark in the proportion of 0.04 per cent. It is readily soluble in dilute acids, and differs from the alkaloids associated with it in being precipitated from its acid solutions by ammonia. Its formula, deduced from the analysis of its platino-chloride, is $C_{16}H_{19}N O_3$.

Echitamine is obtained from the liquor from which the ditamine has been extracted. On neutralizing this liquor, concentrating it by evaporation, and then adding hydrochloric acid and sodium chloride, impure echitamine hydrochloride is precipitated. The base isolated from this precipitate, and then purified, crystallizes in thick vitreous prisms, answering to the formula $C_{23}H_{28}N_2O_4 + 4H_2O$. When dried in vacuo these part with three molecules of water, leaving a strong base of the formula $C_{23}H_{28}N_2O_4 + H_2O$, or $C_{23}H_{30}N_2O_5$, which the author calls echitamine hydrate, or echit-ammonium hydroxide. If in drying the heat be raised to and maintained at $150^\circ C$., another molecule of water is given off; but the anhydrous echitamine thus left is a much weaker base, and is reconverted into the original alkaloid by dissolving it in hydrochloric acid, and decomposing the hydrochloride. In consequence of the decided loss of basic properties accompanying the elimination of the last molecule of water, the author prefers to regard the monohydrated base as the normal form. The latter is a powerful alkaloid; it neutralizes acids perfectly, and yields well-defined crystallizable salts.

Echitenine.—This base is prepared from the mother-liquors of echitamine hydrochloride, by precipitating with mercuric chloride, decomposing the precipitate with sulphuretted hydrogen, and then shaking with chloroform. It exists in the bark to the extent of only 0.01 per cent. Its composition corresponds to the formula $C_{20}H_{27}N O_4$. It is markedly bitter, of a brownish colour, and fuses above $120^\circ C$. With strong sulphuric acid it forms a reddish violet, and with nitric acid a purple solution, the latter of which changes to green and ultimately to yellow. Its salts are amorphous.

In the author's opinion all these alkaloids belong to one series:—

| | |
|--|----------------------|
| Ditamine | $C_{16}H_{19}NO_2$ |
| ? | $C_{18}H_{23}NO_2$ |
| Echitenine | $C_{20}H_{27}NO_4$ |
| Echitamine Hydrate (Echitammonium Hydroxide) | $C_{22}H_{30}N_2O_4$ |

The Bark of *Alstonia Spectabilis*. Dr. O. Hesse. (*Liebig's Annalen*, cciii., 170.) *Alstonia* bark, known in Java as "poelé bark," is closely allied to dita bark, being the produce of *Alstonia spectabilis*. It differs from dita bark in its anatomical structure and by its exceedingly bitter taste. It was formerly much used in Java and Batavia as a remedy for intermittent fever. It contains all the alkaloids of dita bark (see the foregoing article), but in much larger proportion, the ditamine amounting in it to more than three times, and the echitammonium hydroxide (echitamine hydrate) to fully six times the quantity contained in the bark of *Alstonia scholaris*. Besides the three dita alkaloids, it also contains another base, which was first isolated from it by Scharlée, and named by him "alstonine," but which Dr. Hesse now proposes to call "alstonamine," as the term alstonine has been already applied to a substance obtained from the Australian *alstonia*. Owing to the large proportion of echitammonium hydroxide (0.808 per cent.), and the resemblance of this compound in its physiological action to curarine, this bark must be considered as poisonous, and its use in intermittent fever as attended with danger.

Australian *Alstonia* Bark (*Alstonia Constricta*). Dr. O. Hesse. (*Liebig's Annalen*, ccv., 360–371.) The author has established the presence of three distinct alkaloids in this bark; viz., *alstonine*, *porphyrine*, and *alstonidine*, and has obtained indications of the presence of at least one other alkaloid besides these.

***Alstonine*.**—This name, first used by Palm for a constituent of this bark believed by him to be non-nitrogenous, and subsequently found to be identical with the author's "chlorogenine," has been applied by others to several different substances. Dr. Hesse now proposes that this name should be restricted to the body he formerly called chlorogenine, which is extracted from the bark in the following manner:—The alcoholic extract is dissolved in water, the solution supersaturated with sodium bicarbonate, the brownish flocculent precipitate thus formed removed by filtration, and the filtrate repeatedly shaken with petroleum spirit in order to remove the porphyrine and other substances soluble in this menstruum.

The alstonine (chlorogenine) thus remains in the aqueous solution, from which it is extracted by saturating with caustic soda and shaking with chloroform. The brownish black chloroform solution is now treated with sufficient water and acetic acid, the chloroform removed by distillation, the acid liquid decolorized with animal charcoal, then rendered alkaline with soda; and the alkaloid thus precipitated purified in the usual way. Its composition is represented by the formula $C_{31}H_{30}N_2O_4$. It is brown and amorphous, and when freshly precipitated it is readily soluble in chloroform and alcohol, but difficultly soluble in ether; but when once dried, chloroform and alcohol dissolve it but sparingly.

Contrary to Palm's statement, alstonine is a strong base, and forms salts with acids. Its sulphate, hydrochloride, tartrate, oxalate, and platinocchloride are described in the author's paper.

Porphyryne.—This alkaloid, as already stated, passes into the petroleum spirit during the process described for the preparation of alstonine. It is extracted from the petroleum spirit by acetic acid, with which it forms a solution exhibiting a beautiful blue fluorescence, and forming a reddish white flaky precipitate with ammonia. This precipitate is dissolved in ether, and treated with animal charcoal, which takes up not only a small quantity of the alstonine, but also another basic substance (porphyrosine), which can be dissolved out from the animal charcoal by dilute acetic acid with a splendid purple-red colour. The ethereal solution is then treated with dilute acetic acid, and the acetic solution mixed with ammonia, which precipitates both the porphyryne and alstonidine. The two alkaloids are separated by an appropriate treatment with petroleum spirit, in which porphyryne is very easily and alstonidine more difficultly soluble.

The purified alkaloid is a white amorphous substance, readily soluble in ether, alcohol, and chloroform, and fusing at $97^{\circ}C$. Its composition answers to the formula $C_{31}H_{25}N_3O_3$. The addition of a large quantity of water to the alcoholic solution produces a slight blue fluorescence, which is also observable in acid solutions of the alkaloid. Concentrated pure sulphuric acid dissolves the alkaloid with a purple colour, which becomes paler pretty quickly, and passes into a yellowish or brownish green. Concentrated sulphuric acid containing molybdic acid also dissolves the alkaloid with a purple colour. Concentrated sulphuric acid containing chromic acid dissolves it with a greenish blue, passing into a yellow-green.

Two kilograms of the bark yielded only 0.6 gram of pure porphyryne.

Alstonidine.—This base is separated from its mixture with porphyrine by petroleum spirit, in which it is less soluble than the latter. It is freely soluble in chloroform, ether, strong alcohol, and acetone, and crystallizes upon evaporation of these solutions. Its solutions in alcohol and dilute acids exhibit an intense blue fluorescence. It forms crystallizable salts. Melting point, 181°C . Concentrated pure sulphuric acid, with or without molybdic acid, and strong nitric acid dissolve the alkaloid without any noteworthy coloration. With strong sulphuric acid, containing some potassium bichromate, it forms a bluish green solution, which turns pale after a time; and this feature distinguishes alstonidine from the alstonine of Oberlin and Schlagdenhauffen, which it otherwise much resembles.

The formula of alstonidine was not ascertained.

Viburnum Prunifolium. H. van Allen. (*Amer. Journ. of Pharm.*, September, 1880.) The author gives a lengthy account of his analysis of the root-bark of *Viburnum prunifolium*, from which this bark appears to contain the following constituents:—

A brown resinous body, of a very bitter taste, from which it was found impossible to separate the sugar.

A greenish yellow resin or neutral body, of a bitter taste, slightly soluble in water, freely so in alcohol, called by Krämer, viburnin.

A volatile acid, answering to all the tests of valerianic acid.

A tannin acid, giving a greenish black colour with ferric salts.

Oxalic acid.

Malic acid.

Citric acid.

Calcium, magnesium, potassium, iron, chlorine, and sulphuric acid.

The Resin of Leptandra. J. U. Lloyd. (From a paper read before the American Pharmaceutical Association, and printed in the *Amer. Journ. of Pharm.*, October, 1880.) The author has examined a number of commercial specimens of leptandrin, and finds that their variation in appearance and in sensible properties arises from a different degree of fineness of the powder, and from differences in their composition. He recommends the following formula for the preparation of this resin:—Extract the root of leptandra (properly powdered) by means of alcohol. Evaporate the percolate to the consistence of a thick syrup, and pour the result, with stirring, into ten times its bulk of cold water, decant the supernatant liquid, add to it 5 per cent. of sulphuric acid, boil until the bitter taste disappears, and then wash separately the two resins with water and dry

them, after which mix and powder them. To dry the precipitated resin, place in a vessel and expose, with frequent stirring, to a steam-bath until it is of such a consistence as to break when cold; then break it into small pieces and finish the drying by exposing to the air. The resinous substances obtained by means of sulphuric acid may be dried by simple exposure to the air.

According to many authorities resin of leptandra is inert. The author is decidedly in favour of a dried alcoholic extract, although such must contain a considerable amount of glucose, which exists in the root in large proportion, and is extracted by alcohol. The trouble experienced in drying an alcoholic extract (recorded by Dr. T. L. A. Greve) without the use of foreign substances, and with full preservation of its characteristics, renders its preparation by ordinary methods tedious and somewhat difficult. The following process, however, will be found to give no trouble:—

Extractum Leptandræ Alcoholicum.—Precipitate the evaporated alcoholic extract by means of water, in the manner before directed, and evaporate the liquid to the consistence of a thick solid extract. Dry the resin, powder it, stir the powder into the solid extract, and thoroughly incorporate them. The thick mass is then to be picked into small pieces, spread in layers in a drying closet, and dried by a current of warm air, then powdered. From the foregoing preparation the full effects of leptandra root may be expected.

This, or a similar preparation, deserves to be recognised in the Pharmacopœia. The preparations which are sold under the name of leptandrin constitute an important article of commerce, second, among the so-called resinoids, only to resin of podophyllum (podophyllin). Dried alcoholic extract of leptandra differs to such an extent from the precipitated resin, which was named "leptandrin" by its discoverer (Mr. W. S. Merrell), as to forbid their substitution for each other. If the resin be rubbed with distilled water, and the mixture poured upon a filter-paper, the filtrate will be colourless, almost tasteless, and free from bitterness. Under the same conditions the filtrate from the dried extract is dark coloured and very bitter.

Resin of leptandra will never run together at ordinary temperatures, nor in any atmosphere. On the contrary, extract of leptandra upon exposure to a moist atmosphere, or if not well dried, will run into a hard lump. The yield of dry extract, made by the process above suggested, will average ten per cent. of the weight of root employed.

Aralia Spinosa, or False Prickly Ash Bark. L. H. Holden.

(*Amer. Journ. of Pharm.*, 1880, 390.) The striking difference of the physical characteristics between the barks of false and true prickly ash (*Xanthoxylum*) lies in the appearance of the spines and the fracture of the bark. The former presents spines which are quite numerous compared with the latter; they are about one-fourth of an inch in length, are smooth, slender, and tapering to a fine point; their base is round or oval, and arranged in transverse rows. The latter bark has few spines, scattered irregularly; they are straight, and of the same length, but two-edged, with narrow linear base of about three-fourths of an inch in length. The false bark breaks with a rather tough but nearly smooth fracture. The true is brittle, and breaks with a short, non-fibrous fracture.

The coarsely powdered drug was moistened with alcohol, packed in a percolator, and exhausted with alcohol, the alcohol was removed by distillation, and the residue evaporated to a solid extract. The extract was mixed with alcohol to the consistency of a syrup, then treated with benzin, which removed the fatty matter; this fat was of a dark green colour, probably due to chlorophyll. The residue was then treated with ether repeatedly, until the portion insoluble in ether, after being dissolved in water, would not answer the tests for tannin. The ether was found to remove from the extract the whole of the tannin and resin, and upon evaporating the ethereal solution to dryness and washing the residue with water, the tannin became separated from the resin.

The tannin is precipitated from aqueous solution by acetate of lead; it gives an emerald-green colour with salts of iron; with caustic potash it turns ruby-red; the latter colour is destroyed by oxalic acid. It coagulates albumen; it is an astringent, soluble in ether, alcohol, and water.

The residue from the ethereal solution, after washing with water, was found to be resin. It is a brown opaque mass; powdered, it is of a light brown colour, solid, brittle, fusible, and volatilized by a high heat; it is slightly acrid, soluble in alcohol and ether, insoluble in water, benzin, and chloroform.

The residue from the alcoholic extract, after being treated with benzin and ether, is entirely soluble in water, from which it is precipitated by acetate of lead in the form of a heavy yellow adherent mass, which carries down mechanically the bitter principle; this can be separated by washing with alcohol. Upon evaporation, a lightish yellow substance, in scales, is obtained, which from the following experiments was proved to be a glucoside; to this the name *araliin* is given. Its solution has no effect on litmus. It is

soluble in alcohol and dilute acetic acid, very soluble in water, foaming excessively upon agitation, and the froth being quite persistent; not soluble in benzin, chloroform, or ether. Acetate of lead has no effect upon its solution; no precipitate is produced by platinum perchloride or mercuric chloride; no action by nitric acid and chromate of potassium, nor does it answer to any of the tests for alkaloids. Hydrochloric acid bleaches the araliin and develops the peculiar odour of the plant; the effect of sulphuric acid is similar. Potassium hydrate and ammonia have no effect.

Upon dissolving araliin in water acidulated with hydrochloric acid, and boiling, a white, insoluble, tasteless, and odourless precipitate is formed, for which the author proposes the name *araliretin*. After filtering, testing filtrate for glucose by cupric sulphate and excess of caustic potash, and boiling, a heavy precipitate of red oxide of copper is formed, showing the bitter principle to be a glucoside. Araliin boiled with potassium-cupric tartrate produced a precipitate of red oxide of copper, confirming the preceding test. When araliin is boiled with caustic potash an amber colour is produced.

Upon the addition of a cold solution of tannic acid no change takes place, but on the application of heat a flocculent precipitate is formed.

The Constituents of the Yew (*Taxus baccata*). D. Amato and A. Capparelli. (*Gazzetta Chim. Ital.*, x., 349-355; *Journ. Chem. Soc.*, December, 1880.) The green needles of the yew (*Taxus baccata*) were exhausted successively with ether, alcohol, distilled water, and finally with dilute sulphuric acid, and each extract carefully examined. The extract left on evaporation of the ethereal solution was mixed with dilute sulphuric acid (1 : 20), and distilled in a current of steam, when an essential oil passed over resembling that of wild fennel in odour. The hot acid solution separated from the insoluble residue in the retort deposited an amorphous powder on standing, and the filtrate from this when treated with excess of baryta and agitated with ether yielded an alkaloid. A colourless, non-nitrogenous, crystalline substance was extracted from the insoluble residue above mentioned, by treating it with alcohol and small quantities of animal charcoal. Its purification is a matter of considerable difficulty, and requires a careful attention to details given in the original paper.

The alkaloid is a colourless, crystalline, nitrogenous substance, having a musty odour, sparingly soluble in water, but easily in alcohol or ether. Dense white fumes are produced when a rod

N.

dipped in dilute hydrochloric acid is held near it. It gives a canary-yellow precipitate with phosphomolybdic acid, and with tannin a white precipitate, which becomes crystalline on standing. Picric acid gives a yellow precipitate, iodized potassium iodide reddish brown crystals.

The non-nitrogenous crystalline substance forms stellate groups of needles (m. p. 86–87°), easily soluble in boiling alcohol, but only sparingly in the cold.

The solution obtained by exhausting the yew needles with alcohol after they had been extracted with ether was found to contain the same substances as the ethereal solution. From the aqueous and acid extracts, oxalic acid and small quantities of the alkaloid were obtained.

Artemisia Absinthium as an Insectifuge. M. Poirot. (*Comptes Rendus*, xci., 607.) The author draws attention to the entire absence of insects in those of the great North-American plains which are covered with *Artemisia absinthium*, and suggests the use of this plant as a means of destroying the phylloxera. The latter, in his opinion, would not be able to go through the necessary metamorphoses in a soil manured with the leaves and stalks of this plant.

Variable Activity of Foxglove. W. Mayer. (*Pharmaceut. Zeitung*, 1880.) The stalked leaves of the root and lower part of the stem of the foxglove are much more active than the almost sessile ones from the middle and upper portions of the stem. The period of flowering is the best time for collecting the leaves. The author finds digitalis grown in the Black Forest and other mountainous districts, to possess much greater activity than that grown in the plains of Northern Germany.

The Cinchona Barks of American Commerce. J. C. Reeve. (*Amer. Journ. of Pharm.*, Nov., 1880.) A microscopic examination of sections of cinchona barks met with both in retail and in wholesale American commerce, led the author to the conclusion that about 50 per cent. only of the barks examined were of the official kinds. Of twenty-two barks sold as true red cinchona, only thirteen were the produce of *C. succirubra*. Of fifteen sold as true *Calisaya*, ten only belonged to that species, and of five barks sold as pale or grey bark, only one belonged to *C. officinalis*.

The Constituents of Scilla Maritima. A. Riche and A. Rémont. (*Journ. de Pharm. et de Chim.*, October, 1880; and *Amer. Journ. Pharm.*, October, 1880.) The authors find that the bitterness of the bulbs is very different in comparing even the scales taken from

the same portion, and that the juice may be saccharine, and not at all bitter. This circumstance could be attributed to the time of collection, to a variety of species, or to certain principles which are capable of undergoing modification. The latter is supposed to play an important part, and is attributed to a ternary principle, comparable to soluble starch, gum, or to inulin, which they have succeeded in isolating, and for which the name of *scillin* is proposed, the name of *scillitin* having been applied to the bitter, toxic principle. (The name *scillin*, as suggested by the authors, is an unfortunate one, having already been applied by Merck, of Darmstadt, to a crystallizable, toxic principle [see *Year-Book of Pharmacy*, 1879, p. 211]). The *scillin* of the French authors was found to be readily converted into sugar, either by the action of acids, as also, probably, by diastase or an analogous ferment contained in the plant. Being of itself not saccharine, the bitterness of the squill is supposed to diminish in proportion to its transformation into *lævulose*; the easy change of the *scillin* into *lævulose* explaining also why very little of that substance can be found in the dried powder, in which, on the contrary, sugar predominates.

The proportionate constituents of three bulbs taken at the same stage of development is appended :—

| Proportionate Composition. | Very Bitter Bulbs. | Slightly Bitter Bulbs. | |
|----------------------------------|-----------------------|------------------------|-------|
| Water | 73·80 | 72·00 | 77·57 |
| Cellulose and Insoluble Salts . | 15·59 | 19·80 | 12·53 |
| Scillin | 8·50 | 6·84 | 8·03 |
| Sugar | 0·17 | 0·15 | 0·68 |
| Soluble mineral matter . . . | 0·82 | 0·24 | — |
| Scillitin. | } 2·12 | 0·97 | 1·19 |
| Oxalic, Citric, and Malic Acids. | | | |
| Undetermined substances . . | | | |

For the extraction of the *scillin* the expressed juice was neutralized by carbonate of lime, the decanted liquid distilled in *vacuo* in the presence of a little carbonate of lime in order to neutralize the free acids, and then evaporated nearly to a syrupy consistence. By subsequent treatment with alcohol, the *scillin* was separated in the form of a syrupy liquid, which was removed from the supernatant layer by decantation, and purified by re-dissolving in water, and again precipitating by alcohol.

The substance after successive treatment in the manner indicated, in order to remove all saccharine and mineral matters, was finally

re-dissolved in a little water, and allowed to evaporate at a low temperature in vacuo. It was thus obtained in the form of a spongy, amorphous, yellowish white mass, soluble in water in all proportions, but sparingly soluble in alcohol. Its aqueous solution was found to deviate the plane of polarization to the left, and to possess no reducing action. It is not precipitated by neutral acetate of lead, and by the basic acetate only from concentrated solutions. Heated with nitric acid it forms no mucic acid, thus differing from gum, and is not precipitated by ferric salts, differing also from inulin by its free solubility in water.

By the action of dilute mineral acids the scillin was rapidly converted into a fermentable, strongly lævogyrate sugar, which was recognised as lævulose.

Submitted to elementary analysis, numbers were obtained approximating to the formula $C_{12}H_{10}O_{10}$, the deficiency in carbon found by the experiment being attributed to the small amount of inorganic matter which it still contained.

When dissolved in water it yielded with baryta-water a difficultly soluble barium salt, the analysis of which indicated the formula $(C_{12}H_{10}O_{10})_2BaO$, and which it is suggested may be utilized for the purification of the scillin.

Asarum Canadense, and its Constituents. F. B. Power. (*New Remedies*, December, 1880.) *Asarum canadense*, L., presents but few prominent distinctions from the European species, *Asarum europæum*, and indeed some botanists have considered them as simply varieties of one and the same species. The two plants may, however, be readily distinguished from each other. *A. canadense* is much more pubescent, the flowers of a brighter hue, and the rhizome usually attains a considerably larger size than the European species. The most important difference, however, between the two species seems to be in the nature of their chemical constituents: the rhizome of *A. europæum* possesses, according to several competent observers, acrid, emetic, and cathartic properties, and was considerably employed in Europe previous to the introduction of ipecacuanha. On the other hand, the American species has been found to possess a mild, stimulating, diaphoretic action, producing nausea only in large doses. These differences in therapeutic action, however, may be possibly of degree rather than of kind.

The chemical examination of the rhizome showed this to contain an aromatic volatile oil, starch, gum, a little resin and fat, amorphous yellow colouring matter (seems to be the "asarin" of Graeger), uncrystallizable sugar, a good deal of nitrates, small

amounts of a body exhibiting alkaloidal reactions, but which is only a very feeble base, water, and mineral constituents.

The volatile oil was found to consist of the following components :

1. A very small amount of a terpene, $C_{10}H_{16}$, or *asarene*.
2. The acetic ether of an alcohol isomeric with borneol, and which may be designated as *asarol*. This is present in two modifications, differing considerably in their boiling points and in their behaviour towards polarized light.
3. Apparently a small amount of the valerianic ether of *asarol*.
4. An indifferent neutral body of undetermined constitution, and having the empirical formula $C_{13}H_{16}O_3$. This body, from its analogy with helenin, may properly be designated as *asarin*, but should not then be confounded with the so-called *asarum-camphor*, or other indefinite bodies, which have received the same name.
5. A small amount of a deeply blue-coloured oil, the so-called *azulene*, or *cœrulene*.

Erythrina Corallodendron. M. Rochefontaine. (*Comptes Rendus*, xcii., 733.) *Erythrina corallodendron* is a spiny, leguminous tree of Northern Brazil, where its bark is used, under the name of "mulungu bark," as a sedative and hypnotic. The author reports having obtained from a decoction of the bark, as well as from a solution of the extract, the characteristic reactions of an alkaloid. He has not yet made any further chemical study of this base, but proposes for it the somewhat unfortunately chosen name "erythrine."

A New Constituent of Phytolacca. M. Terreil. (*Comptes Rendus*, xci., 856.) The fruit of both *Phytolacca kœmpferi* and *P. decandra* contains the acid potassium salt of a new organic acid, which the author proposes to name "phytolaccic acid." The aqueous solution of this acid, when heated with hydrochloric acid, yields a gelatinous coagulum, which is insoluble in water but readily soluble in strong alcohol. Both the acid and its salts are amorphous.

Constituents of Stereocaulon Vesuvianum. E. Paternò. (*Gazz.*, x., 157.) This lichen yields to ether a colourless, crystallizable acid substance, identical with atranoric acid, $C_{19}H_{18}O_8$, from *Lecanora atra*. Coppola, who previously examined this lichen, seems to have overlooked this constituent, as he only found succinic acid.

Constituents of Æthelium Septicum. Dr. Wittstein. (*Zeitschr. des oesterr. Apoth. Ver.*, 1881, 341.) J. Reinke and H. Rodewald have recently claimed to have isolated from this fungus a peculiar fatty substance, named by them "paracholesterin." The author points out that this substance is identical with the spermaceti-like

fat isolated by him from the same fungus forty-five years ago (*Repert. der Pharm.*, 1837, 42).

Uses of Soap Bark. (From *Philad. Med. Times.*) One of the constituents of this bark is saponin, a principle widely diffused through the vegetable kingdom, and which makes an abundant froth with water. An infusion of the bark not only acts like a mild soap, but also as a moderate stimulant and astringent to the skin. It has been used with marked benefit in pityriasis capitis, and has produced excellent results in chronic ulcers and eczema of the extremities. The infusion is also a valuable remedy for aiding in arresting fetid perspiration and excessive secretion.

In cases involving the face and armpits, the patient is instructed to dip a small piece of sponge in the infusion and carefully mop over the surface once or twice daily. When the hands or feet are affected, they should be bathed in the solution nightly, or on alternate nights, according to the condition. When a more active stimulant and astringent effect is required, the "tincture of saponin" can be employed with much advantage. The tincture is made by extracting the bark by strong boiling alcohol (four ounces of bark to one pint of alcohol). It is miscible with both water and oil, and has the power of dissolving, emulsifying, and removing fat and dirt from the skin. In many diseases, especially in seborrhœa sicca, it is preferable to the tincture of green soap. It has all the advantages that are claimed for the latter, and at the same time is free from the penetrating and destructive action on the tissues that the latter possesses. This tincture has been used with great benefit, not only in diseases to which the infusion is applicable, but also in general thinning and loss of hair.

Thalictrum Macrocarpum. M. Hanriot and E. Doassans. (*Bull. de la Soc. chim.*, xxxiv., 83.) A short time ago the authors isolated from the root of this plant a yellow, crystalline, neutral principle, which they named "thalictrin." This name they now propose to change to "macrocarpin." It is soluble in water and alcohol, very soluble in amyl alcohol, and insoluble in ether. The name "thalictrine" they now apply to an alkaloid recently obtained by them by exhausting crude macrocarpin with ether. This alkaloid forms colourless crystals, insoluble in water, but soluble in alcohol, ether, and chloroform. With acids it forms well-defined crystallizable salts. It possesses properties similar to those of aconitine.

Gloriosa Superba. C. J. H. Warden. (*Pharm. Journ.*, 3rd series, xi., 495 and 496, from *Indian Med. Gaz.*, Oct., 1880.) *Gloriosa superba* is a climbing plant belonging to the natural order

Liliaceæ, and is found in low jungles, and in the beds of ravines and edges of rivers throughout India.

Its botanical characters are as follows:—Calyx, none; corolla, six-petalled and reflex; germ, superior, thin-celled; cells, many-seeded; attachment, central; style, oblique; flowers, yellow and crimson, mixed; capsule, thin-celled and three-valved, varying in length from one to three inches; seeds, several; embryo, double, and furnished with a perisperm; root, tuberous, cylindrical, bent at a right angle near one end, knotty at the angle, and occasionally much pointed at both ends, varying in length from two to eight inches, generally about the size of a finger or thumb, but sometimes thicker. The knot bears a mark of the stem on the upper surface, and gives attachment to many thin rootlets by the lower. The roots are also found bulbous. The fresh roots are plump and juicy, and surrounded by a brownish epidermis, beneath which is a tegumentary layer of a waxy yellowish hue, in which spots of a deep yellow colour are frequently visible. If the root be dug up before flowering the epidermic covering is white, and is easily separable into layers, and gives marked indications of the presence of tannic acid. On section the root substance is of a white colour, and consists of cells containing starch granules. The juice is strongly acid in reaction, and slightly bitter without being acrid. The old roots are shrivelled in appearance and rather sweet to taste; on section the cells under the microscope are found to be apparently enlarged with a diminution of the starch granules. The roots when dried by exposure to air break with a starchy fracture; but if dried in a hot water oven at 100°, the fracture is glassy. The stem is climbing and herbaceous; leaves, lanceolate, and ending in a tendril.

As the root is reputed to possess poisonous properties, the author made a chemical examination of it with the object of isolating its active principle. After the removal of two resins and the tannic acid precipitated from an alcoholic tincture of the root, he obtained upon evaporation of the filtrate a bitter residue which he regards as the active principle contaminated with resin. It was found to be very poisonous, 0·047 gram injected into the stomach being sufficient to kill a full-grown cat. This hypothetical active principle has been provisionally named "superbine." The investigation being so far incomplete, the author intends to continue it, and promises a further report. From the fact that this plant belongs to the same natural order as squill, and from an observed analogy of its physiological action to that of the latter, he is at present inclined

to assume that the active principle of *Gloriosa superba* is closely allied to, if not identical with, that of *Scilla maritima*.

The yield of extracts, both aqueous and alcoholic, is much greater from new than from old roots.

Sium Latifolium as an Adulterant of Valerian. C. Bernbeck. (*Archiv der Pharm.*, 1880, 431.) The author has very frequently noticed the rhizome of *Sium longifolium*, a variety of *S. latifolium*, as an admixture in valerian root. The spurious rhizome, which is poisonous, greatly resembles true valerian, but is much lighter, and its fibres present a less pithy appearance and are much more wrinkled.

Uses of Oil of Ergot in Therapeutics. Dr. Shoemaker. (*Druggists' Circular and Chemical Gazette*, January, 1881.) The oil of ergot has long been known as one of the principal ingredients of the ergot as found in the laboratory of the chemist. It is the waste material that has been left after preparing the various ergot preparations. If specially prepared, it can be made by the addition of benzine to ergot by the process of displacement, and afterwards allowing the benzine to slowly evaporate. The yield is about 35 per cent.

This oil, which hitherto has been regarded as a useless waste product, now proves to be a valuable therapeutic agent. When applied to the skin it has protective, soothing, and astringent action, and by its absorption frequently assists in nourishing the diseased parts. It is a most useful application in eczema of the lips, in which the surface is tumefied and fissured, and readily bleeds upon the slightest movement of the parts. It is also equally efficacious in cracked nipple. Pieces of cotton saturated with oil of ergot, and placed over the lips or nipples for a short time each evening before retiring generally arrest the diseased state.

Few remedies are so efficacious as oil of ergot in checking the formation of scales in seborrhoea of the scalp and other hairy parts of the body. If there be an accumulation of scales and sebum upon the scalp, and the hair be pasted down to its surface, the free use of oil of ergot, either alone or combined with alcohol, will bring about the most happy result. The oil of ergot is to be preferred for application in seborrhoea of the hairy parts to either olive, almond, or any of the bland oils, both for its cheapness and for its mechanical activity upon the diseased state of the scalp. It not only overcomes mechanically the condition of the parts, but likewise arrests by its soothing and astringent action the dry and lustreless state of the hairs and the deadened appearance of the scalp. This

twofold purpose that the oil of ergot fulfils makes it superior to all the other medicinal preparations that are used for *seborrhœa sicca* at the present time. The oil of ergot is also of great service as a local application in *erysipelas*. Brushing frequently the surface in this disease with oil of ergot relieves by its soothing and astringent action the tender and hot sensation, and causes the puffy dry and glazed appearance to abate. In *rosacea*, after depleting the parts, the application of the oil of ergot will soothe the part, constrict the blood vessels, and thus modify very much the diseased action.

It is also efficacious in various affections of the mucous membrane. In catarrh of the nasal passages, applied by means of a probang, the results were most beneficial. It acted with great promptness in ulceration of the cervix. In gleet, some marked cures had followed by injecting it far back in the urethra. The oil of ergot made into an emulsion, and used in both gonorrhœa and leucorrhœa, has been most successful in a number of instances.

Notes on Cananga Oil, or Ilang-Ilang Oil. Prof. F. A. Flückiger. (*Pharm. Journ.*, 3rd series, xi., 934, from *Archiv der Pharm.*) The tree of which the flowers yield the oil known under the name "ilang-ilang," or "alanguilan," is the *Cananga odorata*, of the order *Unonacæ*; for which reason it is called also in many price lists "*oleum anonæ*," or "*oleum unonæ*."

Cananga odorata is a tree attaining to a height of 60 feet, with few but abundantly ramified branches. The shortly petioled, long, acuminate leaves, arranged in two rows, attain a length of 18 centimetres and a breadth of 7 centimetres; the leaf is rather coriaceous, and slightly downy only along the nerves on the under side. The handsome and imposing looking flowers of the *Cananga odorata* occur to the number of four, on short peduncles. The lobes of the tripartite leathery calyx are finally bent back. The six lanceolate petals spread out very nearly flat, and grow to a length of 7 centimetres, and a breadth of about 12 millimetres; they are longitudinally veined, of a greenish colour, and dark brown when dried. The somewhat bell-shaped, elegantly drooping flowers impart quite a handsome appearance, although the floral beauty of other closely allied plants is far more striking. The filaments of the *Cananga* are very numerous; the somewhat elevated receptacle has a shallow depression at the summit. The green berry-like fruit is formed of from 15 to 20 tolerably long-stalked separate carpels, which enclose three to eight seeds arranged in two rows. The umbel-like peduncles are situated in the axils of the leaves or spring from the nodes of leafless branches. The flesh of the fruit is

sweetish and aromatic. The flowers possess a most exquisite perfume, frequently compared with hyacinth, narcissus, and cloves.

Cananga odorata, according to Hooker and Thomson, or Bentham and Hooker, is the only species of this genus; the plants formerly classed together with it under the names *Unona* or *Uvaria*, among which some possess equally odorous flowers, are now distributed between those two genera, which are tolerably rich in species. From *Uvaria* the *Cananga* differs in its valvate petals, and from *Unona* in the arrangement of the seeds in two rows.

Cananga odorata is distributed throughout all southern Asia, mostly, however, as a cultivated plant. In the primitive forest the tree is much higher, but the flowers are, according to Blume, almost odourless. In habit the cananga resembles the *Michelia Champaca*, L., of the family Magnoliaceæ, an Indian tree extraordinarily prized on account of the very pleasant perfume of its yellow flowers, and which was already highly celebrated in ancient times in India. Among the admired fragrant flowers which are the most prized by the, in this respect, pampered Javanese, the "tjempaka" (*Michelia Champaca*) and the "kenangga wangi" (*Cananga odorata*) stand in the first rank.

From a chemical point of view cananga oil is interesting on account of its containing a compound ether of benzoic acid, the presence of which was first pointed out by Gal. The author of this paper confirms the presence of a benzoic ether, and further shows that of a phenol-like body and of an aldehyde or ketone.

Styrax Preparatus. Dr. J. Biel. (*Pharmaceut. Zeitschr. für Russland*, 1880, No. 16.) The purification of storax by means of alcohol, as recommended in the British Pharmacopœia, is a wasteful process, as it causes a loss of upwards of 30 per cent. of the balsam. The author suggests the use of benzol in place of the alcohol, as the former dissolves storax much more readily; the filtered solution leaves upon evaporation 90 per cent. of a product superior to that obtained with alcohol.

Japanese Isinglass. Dr. L. Marchand. (Abstract of a paper in the *Bull. de la Soc. Bot. de France* [2], i., 287. From *Pharm. Journ.*) This substance, known in China and Japan under the name of "tjintiw," has been described by Hanbury as occurring in two forms, the one consisting of quadrangular sticks, from 1-1½ inch in diameter, and 11 inches long, and the other in slender furrowed strips only ¼ of an inch in diameter. The first form appears to be the rarest in commerce, and is usually not so white and transparent as the second form, although this is not always the case.

With a view to determining the algae which enter into the composition of this article, specimens were submitted to microscopical examination, those pieces being chosen which, from their opacity or less transparent and clean appearance, indicated the probability of containing fragments of algae in an unaltered state.

The following species were thus detected :—

Streblonema.—Fragments of a species of this genus, consisting of articulated branched threads, of a brown colour, were found attached to a piece of *Gelidium*, but the fragment was too incomplete to determine the species.

Seytosiphon lomentarius, J. Ag.—A portion of this phæosporous alga, presenting a portion of the tubular frond, with the peculiar constriction characteristic of this species, was found.

Sporacanthus cristatus, Kütz.—This plant was represented by a little mass of branchlets, composed of a single row of cells and terminating in points; in some specimens cruciate tetraspores were found, the specimens corresponding well with Kützinger's figure of the plant ("Tab. Phyc.," v., p. 24, t. lxxxii.).

Ceramium.—The *débris* of algae belonging to this genus were not rare, but the fragments met with were too incomplete to determine the species. One species, so far as can be judged from the presence of spines on the nodes, appeared to be *Ceramium ciliatum*, Kütz., l. c. "Tab. Phyc.," xii., p. 26, t. lxxxvi.

Centroceras clavulatum, Ag.—The specimen detected consisted only of two joints, but these presented such clearly defined characters that there could be no doubt the fragment belonged to the above-named species, since they exactly corresponded with Kützinger's figure, l. c., xiii., p. 7, t. xviii.

Endocladia vermicata, J. Ag.—The *débris* of this alga was very rare. One of the filaments found exactly resembled that represented by M. Suringar ("Mus. Bot. de Leyde," vol. i., Algues de Japon, pl. xxx.).

Gloiopeltis tenax, Turn.—Here and there in the jelly were found portions, not completely gelatinized, closely resembling this species, and the presence of ovoid cruciately-divided tetraspores exactly like those belonging to this plant confirmed the determination.

Gelidium polyoladium, Kütz.—This was found in the form of fragments, often very well preserved, and distinguished from *Gloiopeltis* by the intricate character of the filaments, resembling Kützinger's figure of the plant, l. c., tom. xix., p. 9, t. xxiv.

This species is frequently studded with the pretty diatom, *Arachnoidiscus ornatus*, Sur., which is abundantly met with in

some specimens of Japan isinglass, and by the presence of which M. Menier detected the marine origin of some commercial currant jelly.

Nitophyllum?—Some portions presented a flat frond and hexagonal areolation, which recalled the structure of *Nitophyllum*. These, however, were found only in very small quantity, and in a badly preserved state.

Polysiphonia tapinocarpa, Sur.—This alga was met with in the form of little sections of filaments, consisting of short joints which, on transverse section, showed ten siphons. It seems to belong to the above species, as figured in "*Algæ Japonicæ*," 1870, p. 37, pl. xxv., B. Some fragments of *Melobesia*? were found in this plant.

Polysiphonia fragilis, Sur.—This species is represented by Suringar on the same plate as the last, fig. A. It is distinguished from the last by showing only five tubes in the transverse section.

Polysiphonia parasitica, Grev.—This species has not apparently been yet found on the coast of Japan, but from the fragments possessing eight or nine siphons, and from other characters which were well preserved in the specimen examined, there can be but little doubt that they belong to the above species, as figured by Kütz., *l. c.*, xiii., p. 9, t. xxvi.

Diatomacææ.—The author has found a large number of species belonging to this group, but especially *Arachnoidiscus ornatus*, Ehr., described and represented by M. Suringar, "*Algæ Jap.*," fasc. iii., p. 5, pl. i., and by M. Menier.

The above are by no means the only species which enter into the composition of Japanese isinglass, but a large number of others, which were observed to be different, were too damaged to be recognisable. The two forms of the article seem to be made with the same algæ, so far as it is possible to judge from the species found in them, but with this difference, that in the quadrangular form *Gloiopeltis* seemed to be the chief ingredient, while in the slender sticks *Gelidium corneum* was most abundant. This, however, may not be the case in all samples. It seems probable that the Japanese and Chinese search their coasts for such algæ as furnish mucilaginous substances, and having collected them, do not trouble themselves to remove the parasites which are attached to them, or less gelatinous species which are entangled with them, and thus the quality of different species varies considerably. If the gathering consists almost entirely of *Gelidium*, *Gloiopeltis*, and *Endocladia*, the transparency, whiteness, and purity are very noticeable.

The name of Japanese isinglass, inasmuch as isinglass (ichthyocolla) means fish glue, is objectionable, and should not be retained. The name "agar-agar," which has by some writers been proposed for it, has no better claim, since it is applied to various algæ which are not known to enter into the composition of this substance.

According to Mertens (*Preussische Exped. nach Ost Asien, Die Tange*, 1866, p. 140), the following species are employed in the East Indies, under the name of agar-agar:—*Eucheuma spinosum*, J. Ag., *Sphaerococcus serra*, Kütz., *S. gelatinus*, Ag., *Gigartina horrida*, Harv., and at Timor, *Hypnea divaricata*, Grev.

The term gelose is also objectionable, on account of being applied to a definite chemical substance.

The name phycocolle, or seaweed glue, would be preferable, unless the name tjintioiw or lo-thâ-ho be preserved.

Gum Savakin. G. Reimann. (*Amer. Journ. Pharm.*, April, 1881.) This gum is gathered near the west coast of the Red Sea, farther east than the other varieties of gum arabic, and is shipped from the port of Suakin or Savakin; hence its name. It appears in commerce as sub-globular tears, which are more or less broken, have a conchoidal glass-like fracture, and, in consequence of numerous fissures, appear quite opaque. It is imported in considerable quantity, and not unfrequently sold for medicinal use.

A mucilage made with eight ounces of this gum to one pint of water was found to be very thick and viscid, a great deal of the gum remaining, as it seemed, undissolved; this was strained out. On diluting the mucilage with water, it was noticed that what appeared to be small transparent globules separated, and upon repeated shaking would not dissolve. Some of these globules were collected by diluting the mucilage with water, stirring constantly, allowing to settle, decanting the water, and repeating this operation until all the soluble matter had been removed. The globules were found to be insoluble in boiling water, though on the addition of solution of caustic potash, or other caustic alkali, they were dissolved, but the salts of the alkalies were without action. A quantity of the globules spread on panes of glass and dried, yielded thin, transparent scales. On boiling these with water they would merely swell up and be transformed into transparent globules again.

These experiments show that they are analogous to, and doubtless identical with, *gummic acid*, which seems to pre-exist in the gum in the free state, and in the mucilage is held in suspension, while from a dilute aqueous solution it separates as colourless globules.

Numerous expedients were tried to prevent this precipitation, and the only one found successful was to carefully add, before straining, to one-half of the mucilage sufficient solution of caustic potash to make it very slightly alkaline, then add the other half of the mucilage, and shake the mixture well, which should now have a slight acid reaction. After it has stood a little while it can be strained without loss, and may be mixed with water, and otherwise used like that prepared from Kordofan gum.

Five grams of the ash were incinerated, and yielded 0.19 gram of ash, equal to 3.8 per cent. Analysis showed the presence of calcium, magnesium, and potassium.

Notes on Tonicides. A. Janssen. (*Zeitschr. des oesterr. Apoth. Ver.*, 1881, 31.) The author attributes many of the failures of the best tape-worm remedies to the mode of their application, and to improper conditions of the remedies themselves. Pomegranate root-bark, to be efficient should be freshly decorticated, of recent collection, and from wild-grown trees not less than ten years old. It is best administered in the form of an infusion to which a little tannin has been added. A decoction is much inferior to an infusion in its action. If an extract be wanted, this should be made by infusing (not boiling) the bark, and evaporating the infusion at a low temperature. Male fern should be collected in autumn and used fresh; the ethereal extract made from the fresh rhizome is the best form of application. It is most active against *Botrio-cephalus latus* and *cordatus*, but less so against *Tænia solium*. Cusso is a most efficient remedy, provided it consists of the fully developed female flowers (recognisable by their reddish calyces), and is free from stalks. Unfortunately it is but rarely met with in commerce in this condition. The powder prepared from these female flowers proves successful in almost every instance. Kamala, if fairly free from sand and unadulterated, is often found to act exceedingly well.

Bulgarian Opium. A. Theegarten. (*Pharmaceut. Zeitung*, 1881, 261, from *Pharmaceut. Zeitschr. für Russland*, 1881, 229.) Bulgaria has recently produced some very good opium, especially in the Lowtscha district. A sample examined by the author yielded 11.2 per cent. of impure and 8 per cent. of pure morphine. It had a powerful odour, like that of opium of good quality, and a bitter acrid taste. To water it yielded nearly 70 per cent. of its weight.

Notes on the Aloins. Dr. T. F. Hanausek. (*Zeitschr. des oesterr. Apoth. Ver.*, 1881, 183.) Treumann has prepared and examined the aloins from Barbadoes, Curaçao, Socotra, Natal, and Cape aloes. They all form a homologous series; those of Curaçao

and Barbadoes aloes show the closest agreement in their behaviour towards reagents, though they differ in their composition, the former corresponding to the formula $C_{16}H_{17}O_7$, the latter to $C_{17}H_{20}O_7$. Therapeutically the most active is the aloin from Cape aloes, and the least active that of Natal aloes.

Comparative Examination of the most Important Kinds of Commercial Gum Arabic. E. Masing. (*Archiv der Pharm.*, [3], xv., 216.) The author has estimated the solubility, the percentages of moisture and ash, and the alkalinity of the ash in a number of different commercial samples of this gum, and has studied the behaviour of each sample towards solutions of potassium silicate, potassium stannate, lead acetate, aluminium sulphate, and copper acetate. The paper contains a tabulated statement of the results. The author arrives at the conclusion, that although different kinds of gum show differences when thus tested, the source of the gum can seldom be inferred from such an examination. The value of the gum is better judged from its solubility than from its colour; the percentage of ash seldom varies beyond narrow limits, but the alkalinity of the ash is much more variable; the alkalinity was usually entirely or mainly due to lime, and potash was seldom present in any quantity. The ash was invariably soluble in dilute hydrochloric acid, and any quantity of insoluble residue would therefore indicate the presence of sand or other insoluble substances. The differences in behaviour shown by the different kinds of gum towards the same reagent probably indicate the existence of different modifications of gummic acid.

Gum Hogg. C. L. Mitchell. (*Amer. Journ. of Pharm.*, 1880, 230.) Under the above title a peculiar form of gum is described in the U.S. "Dispensatory," p. 1664. It was obtained from the establishment of Messrs. J. B. Lippincott & Co., where it was used in the process of bookbinding. As described by Dr. Wood, "it is in lumps of various sizes, from that of a chestnut to that of a walnut or larger, of an extremely irregular shape, often much contorted, appearing frequently as if consisting of several pieces which had become agglutinated in their soft state, translucent and nearly colourless, with a slight reddish yellow tint in some places, of a rather dull though somewhat shining surface, very hard, brittle, with a glassy fracture, inodorous, and nearly or quite tasteless. With water it swells to a soft transparent mass, which retains this condition long without change; and if now stirred, instead of forming a consistent mucilage, breaks up into minute, irregular, transparent fragments, which retain this form indefinitely."

Chemically examined by Professor William Proctor, jun., it was found to be only very slightly soluble in water, both cold and hot, the solution giving a precipitate with subacetate of lead, but none with oxalate of ammonium, in the latter respect differing from gum arabic. The insoluble portion was dissolved by strong sulphuric acid, and was converted by boiling dilute sulphuric acid into a soluble gum. He considered the insoluble substance to be bassorin, the insoluble constituent of tragacanth, and the gum itself probably the same as Bassora gum. The gum was obtained from the East Indies, but its botanical source is unknown.

The attention of the writer was recently called to this article, and a few experiments and a number of inquiries were made with a view to determine its true relation to Bassora gum. A quantity of the drug was accordingly obtained from the same house which furnished the specimens to Dr. Wood. Upon examination it did not present quite the same physical characteristics which are described by him, but appears to be more a collection of gums from different species, bearing a general similarity to tragacanth. It occurs in fragments of irregular shape, and varying from the size of a chestnut to much larger. Its colour in different samples varies from a dirty white to a yellowish brown. It is hard, inodorous, tasteless, and breaks with a short, glassy fracture. Some fragments have still adhering portions of the bark of the tree from which it has been obtained; while the general appearance of the gum shows it to have been deposited in successive exudations, similar to tragacanth.

A portion of the gum was set aside with a quantity of cold water, when, after the expiration of twenty-four hours, it had swollen up into a soft, white, transparent mass, occupying the lower half of the vessel. When agitated, this mass showed no disposition to form a uniform mucilage, but separated into small, soft, transparent, and rather granular fragments, resembling pounded ice; this subsided to the bottom of the vessel again when it was set at rest. The whole was now thrown on a filter, and the filtrate examined. It gave a very faint precipitate with subacetate of lead, and no reaction whatever with oxalate of ammonium; it was neutral in reaction, and had neither taste nor smell.

A second portion of the gum, treated by prolonged boiling with water, gave the same result as when treated with cold water. The insoluble portion was next examined. Alcohol and ether had no solvent action upon it. Boiled with dilute sulphuric acid it was soon dissolved, the resulting solution showing no reaction with tincture of iodine, and not responding to Trommer's test for sugar.

When boiled with a weak solution of an alkali or alkaline carbonate, it was speedily converted into a uniform thick mucilage of a pinkish colour. These tests correspond with those for bassorin, and show a close similarity of the present gum with that previously described by Dr. Wood, and to the Bassora gum of other writers.

The conclusion arrived at by the author is, that gum hogg is not the product of any particular tree or plant, but is a trade name applied to various cheap and inferior gums, all probably identical with Bassora gum, and containing and consisting almost entirely of bassorin.

While the solubility of bassorin in alkaline solutions has been but briefly alluded to in various works, it seems to indicate certain properties which might almost entitle it to be considered as an acid, similar in its nature to the arabic or gummic acid of gum acacia.

The remaining part of the author's paper deals with the commercial history of this gum, and with its use in bookbinding.

Xanthorrhœa Resins. Prof. J. M. Maisch. (From a paper read at the Philadelphia Pharmaceutical Meeting, April 19th, 1881, and published in the *Amer. Journ. of Pharm.*, May, 1881.) This paper contains a useful *résumé* of the literature of these resins, from which we extract the following:—"The genus *Xanthorrhœa* belongs to the natural order of Liliaceæ, is confined to Australia, and consists of shrubby or arborescent plants, somewhat palm-like in appearance, and having at the summit dense tufts of very long, wiry, narrow, two-edged, or somewhat triangular leaves, resembling grass leaves; hence the name, *grass-trees*, by which the species are known in Australia. The leaves are used as fodder for cattle; and the somewhat sheathing base of the inner leaves and the buds are eatable, and form, particularly when roasted, an agreeable article of food. From the centre or the leaf tuft there rises a long cylindrical scape, which terminates with a long spike of small white flowers, situated in the axils of the imbricate bracts, and producing triangular three-celled capsules, containing flattish, hard, black seeds.

R. Brown (1810) described seven species, viz., *X. arborea*, *australis*, *hastilis*, *media*, *minor*, *bracteata*, and *pumilio*. The two first-named species are arborescent, while the third and fourth have short stems, that of *X. hastilis* being about four feet high, and is said to sometimes attain a diameter of one foot, and then to be probably more than a century old, owing to its slow growth. The last three species named are stemless, i.e., the stems remain buried in the soil or scarcely rise above ground.

All the species abound in a resinous juice, which, on exposure, har-

dens, and as obtained from the different species undoubtedly differs in appearance and also in composition. Guibourt distinguishes three xanthorrhoea resins—one yellow, one brown, and one red. The dark-coloured resin is still ascribed by some authors to *X. hastilis*, but Drummond (1840) pointed out that an arborescent species, probably *X. arborea*, is in Australia called *black boy*, and the Pharmaceutical Society of Victoria state that *X. australis* (which is arborescent) yields a large quantity of a brilliant ruby-coloured resin. On the other hand, the botanist Smith refers the yellow resin to *X. hastilis* and some other species. The last named is the *X. resinosa* of Persoon, and *Acaroides resinifera* is quoted as a synonym in Gray's "Supplement." The name acaroid resin is thus explained. The different xanthorrhoea resins have been described, more especially in regard to their uses, in papers by Mr. Redford, as a polishing material, in *American Journal of Pharmacy*, 1863, pp. 453, 454, and by Mr. P. L. Simmonds, in the same journal, 1857, pp. 226 to 228, and in 1866, pp. 465 to 468; the papers last quoted refer chiefly to the use of the resin in the manufacture of illuminating gas. The resins seem to be obtained as natural exudations, the subterraneous portions of the plant producing them in some species, at least, apparently in great abundance; but resin is also found covering the base of the leaves, and it is secreted in such quantity in the woody stems, that after crushing the latter it may be sifted from the chips to the extent of a hundredweight per diem by one labourer.

The *acaroid resin*, which was first noticed in 1789 by Governor Phillips ("Voyage to Botany Bay"), is met with in tears and in large masses usually, on account of its brittleness, broken into irregular pieces. It is intermixed with portions of wood, stalks, earth, etc., and when fractured has a speckled or granitic character. The *pure resin* is reddish yellow; the commercial article is externally brownish yellow, and internally opaque and of a pure yellow colour, resembling that of gamboge, but always much lighter; but since the resin is described by some authors as being of a deeper yellow than gamboge, it is evident that it must be sometimes collected from different species. Triturated with water it does not form an emulsion. When fresh it has an odour analogous to that of poplar buds, but much more agreeable (Guibourt); the odour appears to approach very nearly that of benzoin mixed with a little storax. By age the odour becomes weaker, and gradually disappears, but is always developed on powdering or by fusion. The resin dissolves in alcohol, leaving only 0·07 of a gum insoluble

in water and analogous to bassorin. When heated it gives off white vapours, condensing into brilliant small laminæ, which Laugier regarded as benzoic acid, but which Stenhouse (1848) found to consist largely of cinnamic acid.

The *brown resin* has a more balsamic odour than the preceding; the tears are roundish, externally deep red-brown, and resembling dragon's blood; but the fracture is shining, glass-like, and in thin splinters it is perfectly transparent and of a hyacinth-red colour. It is completely soluble in alcohol, and contains more volatile oil, rendering it viscous and somewhat adhesive.

The *red resin* is in distinct tears of a deep brown-red, and sometimes externally bright red; its fracture is glass-like; thin splinters are transparent and ruby-red; it is completely soluble in alcohol, the ligneous intermixtures excepted, and its balsamic odour always becomes apparent on heating.

Regarding the composition of the xanthorrhoea resins, Pereira quotes the analyses of Lichtenstein (1799), Schrader, Laugier, Widman (1825), Trommsdorff (1826), and Stenhouse (1848). Heated with manganic binoxide and sulphuric acid, acaroid resin evolves the odour of oil of bitter almonds, and by the action of nitric acid it yields a large proportion of carbazotic (picric) acid with little nitrobenzoic and oxalic acid (Stenhouse). Trommsdorff found the volatile oil to be colourless, fragrant, and of a pungent aromatic taste. The resin is soluble in solutions of the alkalis and alkaline earths. On dry distillation much carbolic acid is obtained, with a small quantity of a light oil, but, according to Sommer, no umbelliferone. In 1866, Hlasiwetz and Barth ascertained that acaroid resin on being treated with fusing potassa yields large quantities of paraoxybenzoic acid, and from the mother-liquor of the ethereal solution a little resorcin and pyrocatechin was obtained, together with the double compound of protocatechuic and paraoxybenzoic acids = $C_{14}H_{12}O_7 \cdot 2H_2O$, which had been previously obtained from benzoin.

Three different xanthorrhoea resins were found by Hirschsohn (1877) to be incompletely soluble in chloroform and ether, but to dissolve completely in alcohol, the solutions acquiring a brown-black colour with ferric chloride. The solution of the acaroid resin is yellow, and yields with lead acetate a precipitate, while the other two resins are red, that of *X. quadrangulare* being not disturbed by acetate of lead, while that of *X. arborea* produces with the same reagent a turbidity; the chloroformic solution of the latter is yellow, that of the former colourless.

The xanthorrhoea resins have been repeatedly suggested as possessing some value in perfumery ; but they appear to be inferior for this purpose to benzoin, storax, and the balsams of Peru and Tolu. Their medicinal properties appear to be likewise not well marked. As early as 1795 acaroid resin was said by Kite to neither vomit, purge, nor bind the belly, nor to act materially as a diuretic or diaphoretic. Dr. Fish (*Boston Journal*, x., p. 94) employed it in the form of tincture with opium in fluxus hepaticus and the diarrhoea of phthisis, and it has been recommended in chronic catarrhs. A tincture of acaroid resin, which has been given in doses of f3j. to f3ij. mixed with milk or a mucilaginous liquid, has been recommended to be made of equal weights of the resin and alcohol, and, according to another formula, of resin 3ij. to alcohol Oj. If used at all, the latter formula would appear to furnish a preparation of proper strength.

The Resin of Larrea Mexicana. J. M. Stillmann. (*Ber. der deutsch. chem. Ges.*, xiii., 754.) The resinous substance found on the twigs of the *Larrea Mexicana* and *Acacia Greggii* in Arizona and California, appears to be identical with Indian shellac. It yields 61·7 per cent. to alcohol, 1·4 per cent. to water, and 30·9 per cent. to solution of caustic soda, and leaves 6 per cent. of residue insoluble in these solvents.

Constituents of Frasera Walteri. G. W. Kennedy. (*Amer. Journ. of Pharm.*, 1881, 280.) The author has examined the yellow crystalline principle obtained by J. U. Lloyd from the root of the American calumba, and finds it to be identical with the one isolated by himself in 1873 (*Proc. Amer. Pharm. Assoc.*, 1873, 636). The results of his recent examination confirm his previous impression that the root of this plant contains the same principles as *Gentiana lutea*. The only difference between the two roots seems to be that *Frasera Walteri* contains a larger proportion of gentisic acid, and gentian more of the bitter principle (gentio-picrin).

A New Constituent of Senega. H. W. Langbeck. (*Pharmaceut. Zeitung*, 1881, 260.) A sample of old senega root examined by the author had a strong odour resembling that of oil of wintergreen. Water distilled from the root gave upon testing unmistakable indications of methyl salicylate. Other specimens of the root gave the same result, old ones yielding much more of this body than those of more recent collection. A decoction of the older root also contained a not inconsiderable proportion of glucose, while that of a root only twelve months old only contained traces of this sugar. The author regards both the methyl salicylate and the glucose as

products formed by a slow but steady spontaneous decomposition of the senegin contained in the root.

Sequoia Gigantea. G. Lunge and T. Steinkauler. (*Ber. der deutsch. chem. Ges.*, xiii., 1656-1658.) The leaves of *Sequoia gigantea*, the Californian giant pine, contain three essential oils, differing in their boiling points, and a white crystalline body corresponding to the formula $C_{18}H_{10}$; the latter, which the authors propose to name *sequoine*, is soluble in all ordinary solvents except water, exhibits a strong blue fluorescence, fuses at $105^{\circ}C$., and boils between $290-300^{\circ}C$. It is isomeric with fluorene.

Constituents of Lithospermum Officinale. M. Belohoubek. (*Bied. Centr.*, 1880, 703.) The leaves of this shrub are known as "Bohemian tea," and are used to adulterate ordinary tea. The author's analysis shows them to have the following composition:—

| | |
|--|-------|
| Cellulose | 5.96 |
| Tannin | 8.25 |
| Fat | 9.29 |
| Other non-nitrogenous organic substances | 26.49 |
| Albumen | 24.54 |
| Water | 9.85 |
| Ash | 20.59 |

These leaves therefore differ from tea leaves in containing less tannin, much less cellulose, considerably more ash, and no theine.

Sambucus Niger. M. Govaerts. (*Répertoire de Pharm.*, 1880, 529.) The author has investigated the elder with the object of ascertaining what parts of the plant and what pharmaceutical preparations are the most suitable for medicinal administration. He finds that the juice from the fresh berries, given in doses of about 60 grams along with 5 drops of essence of peppermint, is the best form for administration as a laxative. The juice of the bark likewise answers well, also a wine of the fresh bark, representing 80 parts of the latter in 100 parts of the wine, and given in doses of 15-30 grams. Both the leaves and the bark, if wanted in the dried state, should be dried at a very moderate heat, as a high temperature destroys the active principle.

Rhinacanthus Communis. Dr. P. Liborius. (*Pharm. Journ.*, 3rd series, xi., 795.) During a stay in Hong Kong and Shanghai, the author observed that a tincture of an unknown fibrous root was successfully used as a remedy against ringworm. The root afterwards turned out to be that of the *Rhinacanthus communis*, N. ab E., the leaves of which, bruised and mixed with limejuice, are, according to Dymock (*Pharm. Journ.*, 3rd series, vii., 190), used in

India as a popular remedy for "Indian ringworm." Subsequently a chemical examination of the root was made by the author in the laboratory of Dorpat (*Pharm. Zeit. f. Russl.*, Feb. 7), the principal result being the isolation of a quinone-like body, supposed to be the active constituent, resembling chrysophanic and frangulic acids in its antiseptic and antiparasitic properties, and phlobaphene in some of its decomposition products. The author calls this new substance "rhinacanthin," and represents it by the formula $\alpha\text{C}_{14}\text{H}_{18}\text{O}_4$. Its presence in the plant is said to be limited to certain intercellular spaces occurring in the bark, the cellular tissue of this part appearing to be filled with an intensely red substance, supposed to consist of a compound of rhinacanthin with an alkali. It is obtained by exhaustion of the powdered root fibres with absolute alcohol. Rhinacanthin has the peculiarity of forming with bases beautiful red compounds, that are easily decomposed by certain neutral solvents, such as petroleum spirit, which dissolves the rhinacanthin and assumes a yellow colour.

Euphorbia Villosa. (*Allg. Med. Cent. Zeitung*, March 26, 1881.) In the Ukraine and Galicia this plant is said to be regarded as an unfailing remedy against hydrophobia, provided it is taken within five or six days of the infection. Unusually good evidence seems to be in its favour.

Composition of the Seeds of Soya Hispida. H. Pellet. (*Comptes Rendus*, xc., 1177.) The seeds of this leguminous plant, growing in China and Japan, have the following composition:—

| | |
|--------------------------------------|----------------|
| Proteides | 35.5 per cent. |
| Fat | 16.4 " |
| Cellulose | 11.6 " |
| Starch, Dextrin, and Sugar | 3.2 " |
| Mineral substances | 4.8 " |

Russian Linseed. A. Ladureau. (*Bied. Centr.*, 1880, 670, 671.) Russian linseed when grown in France becomes valueless after the second generation. The author, who has investigated the causes of this change, finds that, after cultivation in French soil, the seeds yield an ash containing less than half the amount of phosphoric acid present in the Russian seeds from which they were produced.

Castoreum. J. Fuchs. (*Archiv der Pharm.*, March, 1881, and *Pharm. Journ.*, 3rd series, xi., 873.) The author corrects a number of erroneous statements, met with in books, with reference to this drug. In addition to much experience in the examination of commercial specimens, he had the opportunity of removing the castor

from no fewer than seven beavers. We extract the following from his statements :—

In most of the recent pharmacognostical works it is stated that castor occurs in the sacs in the liquid condition, and afterwards dries up. This opinion is quite incorrect. In former times, when the beaver was not so rare as at present, pharmacognosists, and consequently also the older pharmacopœias, described the consistence of castor as being like that of an ointment; and this accords with the author's own experience.

Although a liquid has been found by some persons in the castor sacs, this can only have occurred in cases where the sacs were taken from diseased animals; the author himself has met with it there in one case. It may justly be affirmed, that the castor substance is secreted by glands in the sacs themselves, and that it occurs in them not in a liquid but an unctuous condition.

Canadian castor has a much weaker and quite different smell—recalling that of old willow bark—from that of European or Siberian castoreum, which has an entirely characteristic, very strong smell, considered by several pharmacognosists to resemble that of birch oil or Russian leather. This difference in odour is the most certain distinguishing character of the two kinds of castor occurring in German commerce. Frequently the effervescence with acids is given as a character of the European and Siberian castor, it being said not to occur with the Canadian. In fact, Canadian castor scarcely ever does effervesce with acids. But neither do the European and Siberian castors always effervesce with acids, and the best sorts effervesce the least. Indeed, upon pouring acid upon the substance of either of the two kinds of castor, bubbles always adhere to it, but these are only air bubbles. As a rule, the author has never observed in the Canadian castor that diseased condition, in which carbonate of lime frequently collects in considerable quantity, as repeatedly observed by himself and others. In this respect his observations differ from those of Weber, who alleges that he found a larger amount of calcareous substance in the Canadian castor.

Further, the shape of the sac has been indicated as a character by which the two commercial varieties of castor may be distinguished. The European and Siberian sacs are said to be more flat and rounded, whilst the Canadian are more pear-shaped. This is not, however, always the case. Those sacs which allow of being divided entirely or even partially into two halves, are ordinarily flat also in the Canadian, but they occur in that kind very seldom;

whilst in both kinds the pear-shape occurs frequently, and in the Canadian almost constantly. The egg-shaped sacs are always somewhat suspected in the European as well as the Siberian castor, on account, probably, of the large proportion of carbonate of lime contained in them, by which the drug is diminished in value. The Canadian castor is frequently adulterated. Sacs are met with from which, after keeping some time, especially in summer, a black mass flows out, which is nothing more than a resinous substance. From such sacs the outer skin, after moistening in water, can frequently be separated tolerably easily. The artificial sacs, however, do not occur now so frequently as formerly. Such falsifications may be guarded against by purchasing the best, and by breaking each sac in the middle and taking only those in which it can be distinctly seen that the substance is permeated by membranes. This is easily done, because the Canadian castor usually occurs in a very dry condition, whilst in the softer sacs a good knife removes every difficulty.

The Musk-Deer in Tibet. R. Lydekker. (*Journal of Applied Science*, February 1, 1881.) As some degree of doubt seems hitherto to have prevailed among naturalists whether the musk-deer (*Moschus moschiferus*) occurs on the Tibetan plateau, or whether it is confined to the wooded districts of the Alpine Himalaya, the author has contributed to the *Journal of the Asiatic Society*, of Bengal, a brief paper, in which he gives the result of his recent investigations of the subject. The author says that during the summer of last year he met in Lahul a Tibetan, who had formerly occupied a high official position at Lhasa, and who informed him that the musk-deer was of common occurrence on the Tsanpu River, in the neighbourhood of Lhasa. He has also learned from Mr. W. H. Johnson, British Commissioner in Ladakh, that it is found in the country below, and to the east of Lhasa, along the course of the Tsanpu River. The musk brought from this district, Mr. Johnson says, has wrongly acquired the name of Khoten musk; this appears to have originated from the fact that Khoten being a large Buddhist city and important trading place, the musk was carried there from Lhasa, and thence to India. Mr. Johnson also observes, that the musk-deer occurs only where the birch tree grows. This evidence, added to what he has collected from various works on Tibet and the neighbouring regions, appears to the author to show that a species of *Moschus* occurs in Tibet, though he has no means of knowing whether it be the same as *M. moschiferus*. The musk-deer is of common occurrence in Bhutan, and it appears to him probable that

it extends north of that district, in most of the open countries up to Tibet, and thence across or round the Gobi desert into Siberia. The occurrence of the musk-deer far in on the Tibetan plateau is a fact of considerable importance, in the author's opinion, as it is the only instance of any of the large mammals of the forest-clad Alpine Himalaya extending its range into the dry and desert regions to the north.

The Preparation of Syrups by Percolation. G. H. C. Klie. (*Amer. Journ. of Pharm.*, 1881, 1.) The author proposes to dissolve the sugar in the preparation of syrups by a process of percolation. For this purpose sponge should be substituted for the cotton wad. A piece of common close soft sponge is trimmed to a cone shape, of a suitable size. The sponge is thoroughly washed, and while still moist placed in position in the neck of a percolator, funnel, or other suitable vessel, by slightly compressing it. Sponges with small pores need little, while those with large pores require more, compression in adjusting. If it is placed too loose, the syrup will pass fast and not sufficiently clear; if placed too tight, the syrup will pass too slow or not at all. The proper amount of compression is reached when the pores of a close sponge, one inch long and half an inch in diameter, are closed in such a manner by adjustment in a three-quarter inch necked common half-gallon glass percolator, that one pint of syrup will percolate in an hour. According to the size of the sponge, its compression, the size of the neck of the percolator and its capacity, less or a great deal more may be obtained. When definite quantities of syrups are made, the sugar towards the end of the process must be heaped near the centre of the percolator, because, since the process of displacement proceeds faster in the centre over the orifice than at the circumference of the percolator, the sugar is dissolved fastest there, and when dissolved down to the sponge allows the menstruum to pass without dissolving the remainder. In a continuous process this precaution is unnecessary. By percolation, when properly conducted, syrups are obtained absolutely clear, just as if filtered through paper.

The process is said to answer well for all the officinal syrups; and particularly for fruit syrups. Strawberry syrup was prepared as follows:—A gallon of fresh, plump fruit, after being pounded into a pulp of uniform consistency, in a porcelain mortar, was put into a glass vessel, covered, and allowed to ferment. This, according to the state of temperature, may take from three to five days. To accelerate and complete the process of fermentation, the vessel ought to be shaken once or twice a day, to re-incorporate the mass

which gathers on the surface of the juice. When fermentation has been completed, this mass will generally settle to the bottom of the vessel. When the expressed fruit juice is fermented no shaking is necessary; but the work of gaining the juice by pressure is exceedingly tedious, on account of the gelatinous consistence (pectin) of the fruit, which allows the pressure to be but very slowly and gradually applied. If the pressure is applied suddenly and powerfully, the press bag or cloth will be torn invariably. On account of this drawback it is more expedient to ferment the crushed fruit and then express. Fermentation can be observed, and its cessation determined to a nicety, if a bent glass tube inserted air-tight in the cork of the vessel containing the fruit, and the free limb of the tube is made to dip about half an inch into water contained in a small glass vial, when the finishing of fermentation is indicated by cessation of evolution of carbonic acid gas escaping through the glass tube under water in small bubbles. The expressed, fermented juice from the gallon of strawberries measured two and three-quarter pints. This was percolated with seventy-two Troy ounces loaf sugar. The resulting syrup measured five pints. Raspberry syrup was prepared in the same manner. Both syrups were kept for two years and showed no signs of spoiling. To insure the keeping qualities of syrups prepared by percolation from fermented fruit juices, it is of paramount necessity to use only juices which have been completely fermented. The syrups ought also to hold in solution a sufficient quantity of sugar. Percolation regulates this to a nicety; by it as much sugar will pass into solution as can be conveniently held, and this is the proper amount a syrup ought to contain. Percolated syrups will not deposit any crystallized sugar in the bottles unless they are exposed to a very low temperature.

The Conditions Necessary for Successful Percolation. J. U. Lloyd. (*Proceedings Amer. Pharm. Assoc.*, xxvii., and *Pharm. Journ.*, 3rd series, xi., 192-196, and 210-214.) A long and elaborate paper on the subject of percolation. Not suited for abstraction.

Saccharated Carbonate of Iron. C. Tanret. (*Journ. de Pharm. et de Chim.* [5], ii., 469-471.) While it is well known that sugar prevents or retards the atmospheric oxidation of ferrous carbonate, there are differences of opinion as to the cause of this protecting influence. Some regard the action of sugar as a mere mechanical one; others believe that the sugar acts as a deoxidizing agent; and others again attribute the preservation of the iron salt to a chemical combination with the sugar. The author inclines to the last-named opinion. He states that some "masse de Valette" which had been

made with sugar of milk instead of cane sugar, was observed after two years to be interspersed with numerous opaque crystals of a brown colour. The outer surface of the mass appeared blackish, but the interior had the same greenish grey colour as on the day the mass was made, and was found to contain a mere trace of iron in the ferric state. When treated with neutral solvents, the crystals were decomposed into sugar, which passed into solution, and ferrous carbonate, which was precipitated. From the percentage of iron found by analysis, this crystallized ferrous sucrocarbonate appears to have a composition $(C_{12}H_{22}O_{11})_3(FeCO_3)_2$

Rademacher's Tincture of Acetate of Iron. O. Schlickum. (*New Remedies*, 1881, 52.) The author proposes the following modified process for the preparation of this tincture:—

| | |
|---|-----------|
| Solution of Persulphate of Iron (sp. gr. | |
| 1·818) | 25 parts. |
| Solution of Acetate of Potassium (sp. gr. | |
| 1·180) | 31 „ |
| Alcohol | 38 „ |

Mix, let the mixture stand for twenty-four hours in a well-covered beaker, then strain through a linen strainer, express, and wash the residue with a mixture of equal parts of water and alcohol until 80 parts of liquid are obtained. To this add 20 parts of water.

The resulting tincture (100 parts) has a handsome red colour, is very limpid, and keeps exceedingly well, though at first it may deposit very small quantities of sulphate of potassium, from which the clear liquid may at any time be decanted without having recourse to filtration. It contains all the iron of the solution of persulphate employed; that is, 2 per cent. of metallic iron, or 8 per cent. of neutral ferric acetate. Both in the percentage of iron, as in that of alcohol, it agrees with the tincture prepared according to Rademacher's original formula. The excess of undecomposed ferric sulphate is not nearly as great as in the latter. Since 25 parts of solution of persulphate of iron require, for complete decomposition, $31\frac{1}{2}$ parts of solution of acetate of potassium, it is evident that only a minute excess of ferric sulphate remains undecomposed. At the same time, only *traces* of sulphate of potassium are left in the tincture: 31 parts of acetate of potassium yield, on decomposition, $9\frac{1}{2}$ parts of sulphate, of which $8\frac{1}{2}$ parts crystallize out from the alcoholic solution during the first twenty-four hours. The remaining $\frac{1}{2}$ per cent. is mostly deposited during the first period of preservation.

Another method is the following :—

| | |
|--|-----------|
| Solution of Persulphate of Iron (sp. gr. | |
| 1·818) | 25 parts. |
| Crystallized Acetate of Sodium | 14 „ |
| Alcohol | 88 „ |

The sodium salt is added to the iron solution, and *very gently* warmed in a porcelain capsule until it is dissolved. The alcohol is then added, and the whole exposed for some hours to a cool temperature ($8-10^{\circ}\text{C.}$), whereby the sulphate of sodium is almost completely separated in crystals. The precipitate is collected on a linen strainer, expressed, washed with a mixture of equal parts of water and alcohol until the strained liquid amounts to 66 parts, and finally sufficient water is added to bring the product to 100 parts.

Dialysed Iron. L. Magnier de la Source. (*Comptes Rendus*, xc., 1352-1354.) Several specimens of *dialysed iron* were analysed, and found to vary in composition from $12\text{ Fe}_2\text{O}_3\cdot\text{Fe}_2\text{Cl}_6$ to $30\text{ Fe}_2\text{O}_3\cdot\text{Fe}_2\text{Cl}_6$. That known in commerce as Bravais' iron, was found to answer to the latter formula; it was constant in composition, and identical with the basic oxychloride of iron, the formula of which was first accurately ascertained by Graham.

In order to find out whether this constancy of composition was due to the impossibility of separating the whole of the ferric chloride by dialysis, a sample was diluted so as to contain 0·8 per cent. of ferric oxide, and submitted to prolonged dialysis for three months. At the beginning of the experiment, the composition of the liquor was $30\text{ Fe}_2\text{O}_3\cdot\text{Fe}_2\text{Cl}_6$; after one month, $64\text{ Fe}_2\text{O}_3$; after two months, $102\text{ Fe}_2\text{O}_3$; and after three months, $116\text{ Fe}_2\text{O}_3$, to one molecule of Fe_2Cl_6 ; whilst traces of chlorine still continue to pass through the diaphragm. The latter was now in too small proportion to measure quantitatively, but it was placed beyond doubt that the oxychloride of composition $116\text{ Fe}_2\text{O}_3\cdot\text{Fe}_2\text{Cl}_6$ still lost chlorine by dialysis.

The author thinks that these experiments are sufficient to prove that ferric hydrate is, under certain conditions, soluble in water, and that it is unnecessary, in order to explain such solubility, to imagine that the hydrate is engaged in some more or less complex combination. In support of this opinion, it may be mentioned that, from considerations of an altogether different character, Debray, has already arrived at the same conclusion.

When Bravais' dialysed iron is evaporated to dryness and the

residue treated with water, the ferric chloride dissolves, but the ferric hydrate remains insoluble; the hydrate, in solution, and dried at 100° , appears to be the normal salt $2\text{Fe}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$, at least as far as theoretical calculation of the weight of residue from known quantities of solution may be considered to support such a conclusion.

A Substitute for Dialysed Iron. R. Rother. (*New Remedies*, Jan., 1881.) The author points out that much of the so-called dialysed iron of commerce is made merely by saturating a solution of ferric chloride by ferric hydrate, and entirely without any process of dialysis. As a substitute for these preparations, he now proposes a solution of triferric hydrochloride equivalent in iron strength to the official solution of ferric sulphate. Its preparation is as follows:—Upon 15 troy ounces of sodium carbonate (not bicarbonate) pour half a pint of water, and apply heat until a solution is obtained, then pour into this one pint of solution of ferric sulphate, in a rapid and continuous stream and with constant stirring of the mixture. Keep up the heat a few minutes until the effervescence nearly ceases, and add water to the measure of 2 gallons. After a sufficient repose, decant the supernatant liquid, and wash the precipitate three or four times in a similar manner, or until the washings yield no trace of reaction with barium chloride. Collect the ferric hydrocarbonate upon a filter, and when the excess of water has drained away, dissolve it in 1 troy ounce of hydrochloric acid with the aid of heat, and evaporate to the measure of one pint if necessary.

The Gelatinization of Dialysed Iron. Dr. H. Hager. (*Pharmaceut. Centralhalle*, 1880, 44.) The gelatinization of this preparation is liable to occur whenever the process of dialysis has been carried too far and the product is supersaturated with ferric hydrate. The preparation thus gelatinized may be restored again to its proper condition by the careful addition of dilute solution of ferric chloride.

As regards the therapeutic value of dialysed iron, the author states that, from his own experience and that of others, he has every reason to disagree with those who regard this preparation as medicinally inactive.

Dialysed Tinctures. C. F. Heebner. (*New Remedies*, May, 1881.) The author has applied dialysis in the preparation of the tincture of opium, belladonna, aconite, and nux vomica, and satisfied himself that the process is capable of yielding these tinctures, fully equal in their medicinal strength to the corresponding official alcoholic

tinctures of the U. S. Pharmacopœia. The processes by which the alkaloids were detected and estimated in each of the tinctures are minutely described in the paper, but no particulars of any kind are given of the mode in which the dialysed tinctures were prepared, beyond the statement that the drugs were used in the form of powder, and in the same proportion as in the official tinctures.

Preparation of Dry Narcotic Extracts. (*Pharmaceut. Zeitung*, 1881, 67.) The directions of the German Pharmacopœia for the preparation of dry narcotic extracts, yield products which are unsatisfactory on account of their great tendency to absorb moisture. To remedy this defect, a correspondent of the *Pharmaceutisches Zeitung* proposes the use of starch in the place of dextrin. He mixes the starch with the soft extract, and heats the mixture on a water-bath until the starch gelatinizes. The mixture is then allowed to dry and reduced to powder. The product is said to keep much better than that prepared with dextrin.

Preparation of Dry Narcotic Extracts. W. Kirchmann. (*Pharmaceut. Zeitung*, 1881, 116.) The process recommended by the author consists in mixing the soft extract with an equal weight of desiccated sodium sulphate, drying the mixture completely at a temperature not exceeding 50° C., and then adding a further quantity of the sulphate to make the weight of the product equal to twice the weight of the extract employed.

The Stability of Calomel. P. Hoglan. (*Chem. News*, October 8th, 1880.) In the *Druggists' Circular* for August, 1880, is a statement from M. Verne, a French pharmacist, on the stability of calomel, which statement is copied from the *Bulletin de Thérapeutique*. M. Verne finds that calomel mixed with chloride of sodium, sugar, or citric acid, undergoes no change, and that therefore the asserted danger of prescribing them at the same time is fictitious. The conversion of calomel into corrosive sublimate by the chlorides of the alkaline metals, and also by the organic acids, has for a long time been a much-vexed question; and the purpose of the following experiments was to discover the cause of the great discrepancies on the subject, and also to ascertain the correctness of M. Verne's assertion that "the danger of acid drinks when using calomel is pure prejudice."

1. Calomel was mixed with a solution of chloride of sodium, and after standing ten days, at the temperature of 78° F., the filtered liquid gave no evidence of the presence of corrosive sublimate by the stannous chloride test.

2. Calomel and citric acid were treated in the same way, and

after fifteen days the filtered liquid gave a slight greyish tinge with stannous chloride, indicative of the presence of corrosive sublimate.

3. Calomel and sugar were treated in the same manner, and after fifteen days no evidence of corrosive sublimate could be found in the filtered liquid.

4. Calomel and solution of chloride of sodium were maintained at a temperature of 98° F. for one hour, when the filtered liquid gave evidence of the presence of corrosive sublimate.

5. Calomel and sugar and calomel and citric acid, treated in the same manner and at the same temperature, also gave a reaction indicating the presence of corrosive sublimate.

6. Calomel and water, treated in like manner for three hours at 98° F., gave a very slight reaction with stannous chloride. Not so marked as previous ones.

These experiments show, First, that calomel is slowly converted into corrosive sublimate by water at the temperature of the body. Secondly, that chloride of sodium, citric acid, and sugar greatly promote the conversion of calomel into corrosive sublimate, and hence are more or less dangerous when present in the system with calomel. Thirdly, that the discrepancies in regard to the stability of calomel are, in part, accounted for by taking into consideration the temperature at which the experiments have been conducted. Fourthly, that at the temperature of the human body calomel is an unstable compound.

The Preparation of Hydrobromic Acid for Medicinal Use. E. Goebel. (*New Remedies*, 1880, 262.) Of the various formulæ recommended for the preparation of dilute hydrobromic acid, the one probably most used by pharmacists, on account of its simplicity, is that in which solutions of potassium bromide and tartaric acid are mixed and exposed to a low temperature to separate the potassium bitartrate formed. This formula, however, yields an acid by no means as pure as desirable, as it retains a very large amount of bitartrate of potassium in solution; for although this salt is but sparingly soluble in water, it dissolves freely in mineral acids. Even by using alcohol in this formula, as has been recommended by Dr. Rice, the removal of the bitartrate from the solution is not sufficiently complete. Another objection is that under certain circumstances bromine is liberated.

Professor F. Schaeffer suggesting its preparation from barium bromide, some experiments were made for determining a ready method by which this salt can be obtained. It was found that by

heating together bromide of ammonium and carbonate of barium a satisfactory result is gained. The equivalents of these two salts are about the same (98), but it is best to use a slight excess of carbonate of barium, to insure the complete decomposition of the bromide of ammonium. The following is a good working formula,—

| | |
|--------------------------------|------------|
| Pure Carbonate of Barium . . . | 100 parts. |
| Bromide of Ammonium . . . | 95 „ |
| Distilled Water | q. s. |

Triturate the salts well together with a few drops of distilled water, so as to make a damp powder. Put this in an evaporating dish, or a crucible, and apply heat, at first moderate, gradually increasing, stir frequently, and continue the heat until vapours of carbonate of ammonium can no longer be detected by hydrochloric acid. After cooling, dissolve the residue in distilled water, filter, and evaporate, stirring constantly towards the last, until a perfectly dry salt remains.

The salt thus obtained is freely soluble in water, and from it dilute hydrobromic acid can be prepared by simply decomposing it with the requisite amount of sulphuric acid. To prepare a ten per cent. acid proceed as follows :—

| | |
|--|-------------|
| Bromide of Barium | 148 grains. |
| Sulphuric Acid, (96·8 per cent. H_2SO_4 .) | 50·6 „ |
| Distilled Water | q. s. |

Dissolve the barium bromide in about half an ounce, and dilute the acid with about two drachms, of distilled water. Add the diluted sulphuric acid to the solution of barium bromide, filter, wash the precipitated barium sulphate with sufficient distilled water to make the filtrate weigh 810 grains. The commercial sulphuric acid usually being weaker than the officinal acid, more than the above quantity will be required to precipitate all the barium, and more diluted acid must therefore be added very carefully until it no longer produces a precipitate. By this method a perfectly pure hydrobromic acid can be prepared without distillation, provided, of course, the materials used are pure; it is especially important that the carbonate of barium has been well washed, as the adhering chloride of sodium will otherwise contaminate the bromide of barium and also the hydrobromic acid.

The ten per cent. acid can by careful evaporation be concentrated so as to represent 30 per cent. or even more of hydrobromic acid gas.

Acidum Phosphoricum Dilutum. J. U. Lloyd. (*New Remedies*,

July, 1880.) The Pharmacopœia directs that the solution resulting from the action of the warm dilute nitric acid upon the phosphorus should be evaporated to a given bulk, and the residue heated in a platinum dish until excess of nitric acid and its decomposition products are completely expelled. This object, according to the author, is difficult to attain, as the heat required for the complete elimination of nitric acid is often sufficient to cause a partial decomposition of the residue, with the formation of pyro- and meta-phosphoric acids. To obviate this risk, the author suggests the addition of pure alcohol to the concentrated liquid, and further evaporation until all the alcohol is expelled again. The nitric acid is thus eliminated in the form of nitrous ether; and when the odour of the latter has ceased to be evolved, the object aimed at may be considered as accomplished. The following working formula is given for the entire process :—

| | |
|------------------------------------|---------------------|
| Phosphorus | 3 parts. |
| Nitric Acid | 25 " |
| Alcohol | 8 " |
| Purified Animal Charcoal | $\frac{1}{2}$ part. |
| Distilled Water | q. s. |

Mix the nitric acid with 48 parts of distilled water, and pour the mixture into a tubulated and stoppered glass retort capable of holding twice the amount. Then add the phosphorus, and pass carbon dioxide into the retort until the air is displaced. Now connect the neck of the retort with a condenser, stop the tubulure of the retort, and apply the heat of a water-bath until the phosphorus has disappeared. Then pour the liquid into an evaporating basin, and evaporate it until reduced to eight parts. Then add sixteen parts of distilled water and pass an excess of sulphuretted hydrogen into the solution. Allow the mixture to stand for twelve hours, and then filter it through a plug of cotton placed in the tube of a glass funnel. Evaporate this solution by means of a water-bath until it is reduced to eight parts, and cool it. Then add the alcohol and evaporate until there remain eight parts. If it is coloured, or retains a burnt odour, mix the animal charcoal with it and digest for one hour, then add sufficient distilled water to bring it up to the required specific gravity, and filter it through a plug of cotton placed in the tube of a funnel, returning until it passes through quite colourless.

As many pharmacists prefer to make this acid from amorphous phosphorus, on account of the greater safety, the author appends the following formula :—

| | |
|------------------------------------|----------|
| Amorphous Phosphorus | 8 parts. |
| Nitric Acid | 25 „ |
| Alcohol | 8 „ |
| Purified Animal Charcoal | ½ part. |
| Distilled Water | q. s. |

Mix the nitric acid with 96 parts of distilled water in a porcelain capsule of twice the capacity of the mixture, and add the phosphorus. Place the capsule on a water-bath and heat until the phosphorus is dissolved, then evaporate the solution until it is reduced to eight parts. Allow it to cool, then add sixteen parts of distilled water, and pass sulphuretted hydrogen into the solution until the gas is in excess. Allow the mixture to stand twelve hours, and then filter it through a plug of cotton placed in a glass funnel. Evaporate this solution by means of a water-bath until it is reduced to eight parts, and cool it. Then add the alcohol and evaporate on a water-bath until there remain eight parts. If it is coloured or retains a burnt odour, purify it with animal charcoal as above. Finally, add sufficient water to reduce the acid to the proper specific gravity.

This process is absolutely free from danger.

The Solubility of Phosphorus in Alcohol. G. F. Schacht. From a paper read before the Bristol Pharmaceutical Association. (*Pharm. Journ.* 3rd series, xi., 464.) The author's experiments were undertaken with the object of ascertaining the extent to which phosphorus is soluble in alcohol, as opinions on this subject are conflicting. The phosphorus used was cut from the inner portion of a large stick, and the alcohol was almost absolute, its specific gravity being 0.798 at 60° F. In each case the alcohol was allowed to act upon the phosphorus at a temperature of 160° F.

When the experiment was performed in such a manner as to prevent the access of air, the phosphorus in the proportion of one grain to the ounce disappeared very slowly, the mixture requiring very frequent shaking during about four hours, and the constant maintenance of the above temperature.

When, however, the experiment was conducted in a bottle of two or three times the capacity of the solution, the phosphorus disappeared much more rapidly, about twenty minutes usually sufficing for complete solution:

This difference pointed to a partial oxidation of the phosphorus in the last named experiment, and an examination of the two resulting solutions confirmed this impression. Both were distinctly acid, but the latter much more so than the former. Careful titration with

standardised alcoholic solution of soda showed that in the solution prepared as above, without access of air, one-tenth of the grain of phosphorus had been converted into an acid oxide, while in the solution effected with access of air, one-fourth of the grain of phosphorus had been thus oxidized.

All attempts to obtain a solution containing as much as two grains of phosphorus per ounce of alcohol proved unsuccessful.

The author therefore concludes that phosphorus is capable of being retained in solution by cold alcohol to the extent of about one grain to one ounce, but that about one-fourth of the phosphorus exists in such a solution in an oxidized condition.

Proposed Substitution of Phosphate of Bismuth for the Official Subnitrate for Use in Medicine. M. Tedenat. (*Journ. de Pharm. et de Chim.* [5], iii., 421.) The author regards phosphate of bismuth as much preferable to the subnitrate as a therapeutic agent, owing to its constancy of composition, its non-liability to change, and its more reliable action. It may be prepared by dissolving phosphate of soda in distilled water, heating to ebullition in a porcelain or glass vessel, and adding subnitrate of bismuth previously dissolved in a large excess of nitric acid gradually to the boiling solution. The reaction commences at once, and if the boiling be prolonged the phosphate of bismuth is precipitated as a dense white granular powder, separating clearly from the acid liquor in which it is contained. The precipitate should be washed on a filter until the washings are neutral to test paper, and then dried in a stove.

This preparation is given in doses of about one gram, in the same manner as the subnitrate.

A New Antidote for Arsenic. P. Hoglan. (*Pharm. and Chem.*, 1880, 448.) This antidote is recommended by the author on account of its thorough efficiency and the readiness with which it may be prepared from materials always accessible. It is made according to the following formula:—

| | |
|-------------------------------------|--------------|
| Tincture of Chloride of Iron . . . | 1 ounce. |
| Bicarbonate of Soda or Potash . . . | 1 „ |
| Tepid Water | a teacupful. |
| Mix. | |

The Solubilities of Alkaloids in Alcohol. A. H. Lefean. (*Amer. Journ. of Pharm.*, April, 1881.) The method of ascertaining the solubility of the alkaloid was to place a given quantity in a somewhat less quantity of alcohol than that recommended by the text-

books or authorities, contained in an accurately graduated tube, and at ten degrees higher temperature than the standard temperature selected (60° F.). The alkaloid was digested for several hours, with occasional agitation, and if the quantity of alcohol was insufficient an addition was carefully made until solution was effected at this slightly higher temperature. If an excess of alcohol happened to be added, the tube was left unstoppered, to permit of evaporation, for a few hours, until a slight deposition took place. If this failed to be dissolved at a slightly elevated temperature, a very small quantity of alcohol was added, sufficient to take up the slight excess, and the solution was then brought to the proper temperature, 60° F.

This plan was adopted because it completely avoids all risk of saturation, which is likely to happen by the hot process. Moreover, it was believed that it would be better to give solubilities that represent the actual amount dissolved under such conditions as are likely to exist in actual dispensing practice. [See Table opposite.]

Liquor Opii Sedativus and Extractum Opii Liquidum. E. B. Shuttleworth. (*Canadian Pharm. Journ.*, February, 1880.) A liquor opii tolerably free from obnoxious principles may be made by preparing an aqueous solution of opium, concentrating the liquid by boiling, and redissolving the resulting extract. Such is the liquid extract of the B. P., but in order to effect a more thorough separation of narcotine, meconine, meconic acid, resinous, odorous, and extractive matters, the author recommends that the process be repeated several times, and that the resulting liquor be assayed for morphine, and brought finally to such a measure that it shall show, by the pharmacopoeial test, a morphine strength of 3 grains to the ounce, a small proportion of spirit being added to preserve the solution from mould and deterioration by age.

The author has convinced himself that a solution carefully prepared in the manner described is equal in every respect to Battley's liquor opii sedativus; but he particularly insists upon the estimation of the morphine as a necessary part of the process, pointing out that the proportion of this alkaloid in commercial opium varies to the extent of nearly 200 per cent. For the assay of the solution most of the published processes afford satisfactory results; the B. P. method, is perhaps, as good as any.

The obnoxious principles are, in the U. S. P. process for tinct. opii deodorata, removed by treating the opium solution with ether; but the process is wasteful and troublesome, and gives no better product than that above indicated.

In the author's opinion, the B. P. process, with the modifications

| | United States Dispensatory. | National Dispensatory. | Storer's Dictionary of Chemical Solubilities. | Lafayette. |
|--------------|---|---|--|----------------------------|
| Atropine . | Soluble in 8 parts of alcohol. | Soluble in a little alcohol. | 3 to 8 parts of cold alcohol. Easily soluble in alcohol. | Soluble in 2 of alcohol. |
| Cinchonine . | Soluble in boiling alcohol, which deposits a portion on cooling. | Soluble in 140 parts of 80 per cent. alcohol. | Soluble in 1½ parts of cold alcohol. Soluble in 400 parts of alcohol, of 80 per cent. at 17° C. 110 parts, at temperature of boiling. 33-8 parts of strong alcohol. 115-78 parts of alcohol, of 80 per cent. at 18° C. 128-5 parts of absolute alcohol, at about 18° C. | Soluble in 145 of alcohol. |
| Cinchonidine | None given. | Soluble in 20 parts of 80 per cent. alcohol. | 88 parts of cold alcohol of specific gravity .833 and 19 of the same alcohol, at boiling. In 13 of alcohol of .833 sp. gr. | Soluble in 30 of alcohol. |
| Caffeine . . | Soluble in alcohol. | Not freely soluble in water, more so in alcohol and chloroform, but less in absolute alcohol and ether. | 20 parts of alcohol, at 21° C. 26 parts of 86 per cent. alcohol, at 90°. Quickly soluble in boiling alcohol. | Soluble in 150 of alcohol. |
| Colchicine . | Very soluble in alcohol. | Freely soluble in alcohol. | Soluble in alcohol. | Soluble in 3 of alcohol. |
| Daturine . . | Is very soluble in alcohol. | Identical with atropine in solubility. | Vide Atropine. | Soluble in 2 of alcohol. |
| Morphine . | Slightly soluble in cold alcohol, and freely so in boiling alcohol, which deposits it on cooling. | Soluble in 30 parts of boiling and 50 of cold alcohol. | 20 parts of cold and 13 of boiling alcohol, of .823 spec. grav. | Soluble in 215 of alcohol. |
| Narcotine . | Soluble in 100 parts of cold and 24 parts of boiling alcohol, which deposits it on cooling. | None given. | Soluble in 100 parts of cold and 24 of boiling alcohol. | Soluble in 265 of alcohol. |
| Quinine . . | Is very soluble in alcohol. | Soluble in 30 parts of 80 per cent. alcohol. | Soluble in all proportions of cold absolute alcohol, and in almost all proportions of alcohol of 90 per cent. | Soluble in 8 of alcohol. |
| Quinidine . | None given. | Soluble in 45 parts of absolute alcohol. | Soluble in 45 parts of cold absolute alcohol. 3-7 parts of warm ordinary alcohol. | Soluble in 115 of alcohol. |
| Strychnine . | Boiling official alcohol dissolves it without difficulty, and deposits it on cooling. Very sparingly soluble in absolute alcohol. | 190 parts of cold and 10 parts of boiling 80 per cent. alcohol. Sparingly soluble in absolute and dilute alcohol. | 1200 parts of alcohol, of 80 per cent., at ordinary temperature. 10 parts of boiling 50 per cent. alcohol. | Soluble in 175 of alcohol. |
| Veratrine . | Soluble in 11 parts of alcohol of .847 sp. gr. | Soluble in 3 parts of alcohol. | Soluble in 3 parts of cold and 2 of boiling alcohol. | Soluble in 8 of alcohol. |

above suggested, furnishes a thoroughly satisfactory product, and, by adopting the liquid extract, a uniform, legitimate, and comparatively low-priced preparation may be substituted for one which, though reliable, is very expensive, and belongs to a class of remedies which should be discontenanced.

The Solubility of some of the Salts of Morphine. D. B. Dott. (From a paper read before the North British Branch of the Pharmaceutical Society, and printed in *Pharm. Journ.*, 3rd series, xi., 618, 619.) Experiments made with seven different salts of morphine, show the respective solubilities of these in water to be as follows:—

| | |
|-------------------|----------------------------|
| Acetate . . . | 1 part soluble in 2 parts. |
| Valerianate . . . | 1 " " 4½ " |
| Tartrate . . . | 1 " " 9 " |
| Citrate . . . | 1 " " 19½ " |
| Sulphate . . . | 1 " " 23 " |
| Muriate . . . | 1 " " 25½ " |
| Meconate . . . | 1 " " 27½ " |

Morphiæ Acetas, B.P. D. B. Dott. (From a paper read before the North British Branch of the Pharmaceutical Society, and printed in *Pharm. Journ.*, 3rd series, xi., 619, 620.) In the Pharmacopœia instructions for the preparation of acetate of morphine it is directed to "evaporate the solution by the heat of a water-bath until it concretes on cooling," and finally to "dry the salt with a gentle heat." These directions render the composition of the product somewhat uncertain, as by continued exposure to a moderate heat a portion of the combined water will be driven off, but it is probably intended that the salt should only be dried until it is not sensibly moist.

In order to ascertain the exact composition of acetate of morphine prepared by the B.P. process, the author submitted samples of this preparation to analysis. His results show that the official preparation contains 3 molecules of water, and that its formula ought to be given as $C_{17}H_{19}NO_3 \cdot C_2H_4O_2 \cdot 3H_2O$. Such a salt ought to yield by precipitation with ammonia not less than 72 per cent. of morphine hydrate. The formula of the Pharmacopœia is defective in so far as it omits the water of crystallization. As a fact interesting from a posological point of view, the author mentions that the percentage of morphia in the acetate is nearly the same as in the muriate and sulphate. If the acetate were dispensed as an anhydrous salt, an apparently larger dose of morphia would be given than by the same weight of muriate.

Colorimetric Assay of Opium by means of Iodic Acid. Dr. E. Mylius. (*Pharmaceut. Centralhalle*, 1881, Nos. 9 and 10, and *New Remedies*, June, 1881.) The author's process is based on the well-known power of morphine to liberate iodine from iodic acid. The *modus operandi* recommended is as follows :—

0·5 gram of powdered opium is boiled with about 10 grams of water in a 50 c.c. flask, mixed with 3 grams of basic acetate of lead, then filled up to the 50 c.c. mark with cold water. After shaking, and, if necessary, further cooling, the contents of the flask are filtered, and either the whole filtrate precipitated with 15 drops of concentrated sulphuric acid, or an aliquot portion of it by a corresponding amount of acid. The liquid is then again filtered, taking particular care to obtain it absolutely clear. For comparison with this opium extract a standard solution is prepared, containing 0·1 gram of morphine with 3 grams of dilute sulphuric acid in 100 c.c. of water. The iodic acid is best employed in form of a solution in an equal weight of water.

The most suitable apparatus for carrying out the assay has been found to be a simple tube, closed at one end, about 16 centimetres long and 1·5 centimetre bore, which is either completely divided up to 20 c.c., into $\frac{1}{2}$ c.c., or which may, for practical purposes, have divisions only at 5, 10, and 15 c.c., but from this mark up to 20 c.c. should be divided into $\frac{1}{2}$ c.c. At least two of these tubes are necessary, but it is better to have at hand more, so as to be able to make several assays at the same time. The tubes, when in use, are placed in a test-tube rack, and particular care must be used to have them thoroughly clean. The further steps in the process are as follows :—

Into two of these tubes, provided with corks, 5 drops each of the concentrated solution of iodic acid (or 0·08 to 0·10 gram of iodate of potassium, with 2 drops of concentrated sulphuric acid) are introduced, then 5 c.c. of rectified bisulphide of carbon, and finally 10 c.c. of the pure morphine solution into one tube and 10 c.c. of the prepared opium extract in the other. Since the iodic acid is at first separated from the morphine solution by the bisulphide of carbon, no action takes place. The corks having been inserted, the tubes are now briskly shaken, holding one tube in each hand, for two or three minutes, by the watch, if iodic acid was employed, and three to four minutes if iodate was used. The tubes are then replaced in the rack and the bisulphide allowed to separate. In the tube containing the pure morphine solution this takes place within half a minute; in the other tube, if properly prepared, in two to

three minutes. After the bisulphide is separated, the colour of the two columns is compared, which may be done at once, but it is better judged of after about ten minutes, when the solutions have become entirely transparent. If both tints are alike, the opium under examination contains 10 per cent. of morphine. If they differ, more bisulphide is added to the tube containing the darker tint, after having made sure that it still contains 15 c.c. of liquid, until the tints are alike. By reading off the new level, which ought to be done at the top of the aqueous layer, the amount of added bisulphide is ascertained. We then find the percentage of opium by the following equation :—

$$(I.) \quad 5 : 5 + y = 10 : x,$$

where y denotes the volume of the added bisulphide, and x the percentage of morphine in the opium. The result becomes less accurate if some of the pure morphine solution is poured into the tube containing the fainter coloured liquid, until the tint has been darkened to the same shade as the other. In this case the proportion is,—

$$(II.) \quad 10 : 10 + y = 10 : x,$$

where y denotes the added morphine solution, and x the percentage of morphine. In both cases it is supposed that the opium contains more than 10 per cent. of morphine. If it contains less than 10 per cent., the second member of each of the above two proportions would have to be reversed, viz., $x : 10$, instead of 10 to x [or the proportions could be written,—

$$(Ia.) \quad 5 + y : 5 = 10 : x$$

$$(IIa.) \quad 10 + y : 10 = 10 : x].$$

The above process yields results which agree with those of Flückiger, but which may vary by ± 5 per cent. It is not distinguished by very great exactness, but it is highly advantageous, for all practical purposes, by the rapidity of execution and the small amount of consumed material. While Flückiger's process requires twenty-four hours and 4 grams of opium, the above method, if the normal solution of morphine is at hand, only requires 0.2 gram of opium and about twenty minutes. The first filtration consumes the greatest amount of time.

If it is desired to be still more exact, a normal solution of opium may be prepared as above directed, to be brought to such a strength that it contains exactly 0.1 gram of morphine in 100 c.c., tested by

Flückiger's method. This is then to be used in place of the morphine solution, and thereby the small error, caused by the tendency of solution of opium to absorb iodine, is neutralized.

Application of this Process to Tinctures of Opium.—In the tinctures of opium the same process is applicable. It is only necessary to take 5 grams of the tincture, and to observe otherwise the same proportions as before. The alcohol does not interfere with the reaction. The correctness of the method is shown by the fact that a 10 per cent. tincture of opium, made from opium which contained 10 per cent. of morphine according to the before-described process, was found to contain 1 per cent. of morphine by the same process.

In conclusion, the author points out that this colorimetric process is particularly useful for the estimation of minute quantities of morphine and opium, and quotes experiments illustrating its suitability for this purpose.

Notes on Sulphate of Berberine. J. Nesbit. (From a paper read before the North British Branch of the Pharmaceutical Society, and printed in *Pharm. Journ.*, 3rd series, xi., 620.) According to the British Pharmacopœia, this preparation should form with water a clear brown solution, a requirement which the salt met with in commerce never answers. The latter is soluble in the proportion of 1 part to 6 or 8 parts of water, forming a clear and permanent solution; but when this is diluted, or a larger quantity of water is used, a muddy-looking mixture is formed, which on standing deposits a bulky precipitate. Experiments undertaken with the object of throwing light on this apparent defect in the quality of the salt, and on the nature of the precipitate mentioned, convince the author that the commercial salt is deficient in sulphuric acid to the extent of 4 per cent. In a strong solution the uncombined berberine is dissolved by the sulphate, but on dilution it is precipitated. By adding the requisite amount of acid to the solution of the basic salt, evaporating the filtered solution, and re-scaling the residue, the author had no difficulty in obtaining a preparation perfectly soluble, and in every respect answering to the tests of the Pharmacopœia.

Extraction of Colchicine from the Seed. L. J. Morris. (From a paper read before the Philadelphia College of Pharmacy, December 21st, 1880, and printed in the *Amer. Journ. of Pharm.*, January, 1881.) The results of the different experiments described in the author's paper lead to the following conclusions:—

1. That it is a waste of time and useless operation to powder the colchicum seed, as the active principle can be wholly extracted by

digesting them in the ordinary menstrua for a few hours, at a temperature of about 80°C .

2. That alcohol stronger than dilute (sp. gr. .941) is unnecessary for any of the liquid preparations of colchicum seed, since the whole of the alkaloid can be extracted by that menstruum or even with water.

3. That the active principle is so soluble in the menstrua directed in the U.S. official preparations, that it is impossible for it to be precipitated from such solutions, either as colchicine or in the modified condition of colchicëine.

The Testing of Peruvian Balsam. Prof. F. A. Flückiger. (*Pharmaceut. Zeitung*, 1881, No. 30, 222.) This paper, a full translation of which will be found in the *American Journ. of Pharm.*, June, 1881, and also in the *Pharm. Journ.*, 3rd series, xii., 45, gives a lengthy account of the adulterations of Peruvian balsam, and the means employed for their detection. By way of summary it concludes with the following recommendations for ascertaining the purity of this balsam:—

1. The specific gravity at 15°C . must be between 1.140 and 1.145. More extended experience will be required in order to decide whether it is more correct to accept the boundary figures at 1.138 and 1.147. The older statements of the specific gravity as 1.15 and 1.16 are too high; it is a question whether the balsam which in former times was met with in commerce was perhaps heavier.

2. Ten drops of balsam produce with .4 gram of slaked lime, a mixture which does not harden.

3. When shaken with three times its weight of carbon bisulphide, the balsam is separated into a dark brown resin, which attaches itself firmly to the glass, and cinnaëin, which imparts but little colour to the carbon bisulphide.

The lime test, mentioned under No. 2, is not effectual when castor oil (or other fatty oil) is present. On warming such a mixture of lime, however, the fatty odour is plainly perceptible, if not a very small amount of fat is added, and upon ignition decomposition products of the castor oil are formed, which possess a very peculiar odour.

If the adulterant is styrax, benzoin, copaiba, or common resin, the mixture with the lime solidifies in every instance.

The author regards this lime test as a valuable one, and would like to see his experience with it confirmed by more extensive trials with pure and adulterated balsam as met with in trade.

The Testing of Peruvian Balsam. Dr. C. Grote. (*Pharmaceut.*

Centralhalle, 1880, No. 22.) Adulterations of this balsam with common resin have been repeatedly observed. In the author's opinion, any sample having a lower sp. gr. than 1.136 may be suspected. Should the resin amount to as much as 20 per cent. and upwards, it may easily be detected by shaking 3-5 drops of the balsam with 2-3 c.c. of solution of ammonia in a test-tube, whereupon a dense froth will be produced, and the mixture will gradually gelatinize, so that after a quarter of an hour the test-tube may be inverted without spilling any of the liquid. Pure balsam under the same conditions, yields a brownish grey mixture covered by a thin froth, which soon dissipates, and the emulsion remains fluid even after standing for several hours.

The Chemistry and Pharmacy of Ergot. E. Schmitt. (*Bull. de la Soc. de Pharm. de Bordeaux*, xx., 40. From *Pharm. Journ.*) Although the botanical nature and microscopic structure of ergot are now well known, the same cannot be said respecting its chemical constitution.

The earliest labours upon the composition of ergot are due to Vanquelin and Legrip in France, and Maas and Wiggers in Germany. The first complete chemical analysis was published in 1881, by Wiggers, and it was then that the first mention was made of ergotine as the active principle of ergot. With ergotine there were also mentioned a red colouring matter, a non-saponifiable fatty oil, a sugar that was specially studied by Mitscherlich, fungine, an ash very rich in phosphoric acid, etc. As to the more recent investigations, a résumé of them is to be found in the *Traité de Pharmacognosie* of Dr. Albert Wigand (Berlin, 1879), and another in a memoir by Dr. Daubraiva in the *Zeitschrift des allgemeinen oesterreich. Apotheker-Vereines*, 1880, p. 73. According to these later researches, the activity of ergot would be due (1) to two acids, sclerotic acid combined with lime, and fuscosclerotic acid derived from the red colouring matter; (2) to a very bitter alkaloid, picrosclerotine, probably occurring with fuscosclerotic acid in the colouring matter; and (3) to a nitrogenous matter of a gummy nature, scleromucin. Ergot contains 1.5 to 4.5 per cent. of sclerotic acid, and 2-3 per cent of scleromucin, whilst it contains scarcely one part in a thousand of fuscosclerotic acid and picrosclerotine.

In the second rank come alkaloids of doubtful action, ergotine ecboline, and ergotinine, combined with a volatile acid, ergotic acid, and colouring matters, sclererythin, scleriodin, scleroxanthin, and sclerocrystallin.

In the third rank occur the inert matters: 30 to 35 per cent. of

fixed oil, 2 per cent. of resinous matter, 46 per cent. of cellulose, mycose, leucine, secaline, and ash very rich in phosphates.

These analyses do not mention cholesterine, which Schoonbrodt, in 1866, and Ludwig, in 1869, found in ergot. They are mainly the result of the later work of Dragendorff and Podwissotzky, and leave unnoticed other researches made since 1831.

The ergotine of Wiggers, which is the oldest in a chronological point of view, is not an alkaloid. It is a complete extractive matter; nevertheless its elementary composition has been established by Liebig and Pelouze. It is obtained by first freeing ergot from its fixed oil by means of ether or carbon bisulphide, and then treating it with boiling alcohol. This alcoholic tincture is evaporated to dryness upon a water-bath, and the dry extract is exhausted with cold distilled water. The residue insoluble in water is the ergotine of Wiggers, of which the yield is from 1 to 1.25 per cent. This ergotine is very toxic; its action is therefore not uncertain, as is alleged by Dragendorff and Podwissotzky. It occurs in the form of a reddish brown pulverulent extract, having an acrid and bitter taste. It is insoluble in water and ether; it, therefore, contains neither sclerotic acid nor scleromucin, which are soluble in water, nor ergotine, which is soluble in ether. It is soluble in alcohol, to which it communicates a red colour, and contains consequently the colouring matters mentioned above of fuscosclerotic acid and picrosclerotine. It is also soluble in concentrated acetic acid and in alkalis. In consequence of its method of preparation, its complex nature, and its badly defined therapeutic effects, the ergotine of Wiggers has not been employed in medicine.

This is not the case with another extractive product obtained from ergot, and to which M. Bonjean, of Chambéry, has also give the name of ergotine. Bonjean's ergotine is a true mixed extract. It is prepared by exhausting ergot with cold water, bringing the aqueous solution to the consistency of a clear syrup, and freeing this syrup by strong alcohol from insoluble salts, gummy matters, and albuminoids. After filtration the filtered liquor is brought to the consistence of an extract. The preparation and characters of this ergotine will be referred to subsequently; but from a chemical point of view it may be stated that this extract contains probably the sclerotic acid and a little of the scleromucin of Dragendorff, the secaline of Winckler, and the ergotine and ecoboline of Wenzell.

A third ergotine is that of Wenzell, who, whilst studying in 1864 the aqueous extract of ergot, believed that he had discovered in it two alkaloids, ergotine and ecoboline, the first slightly active, the

second possessing the obstetrical properties of ergot and combined with a special acid, ergotic acid.

Wenzell prepared these two alkaloids by heating the aqueous extract of ergot with acetate of lead, filtering, freeing the liquor from excess of lead salt, and afterwards adding corrosive sublimate, which precipitates the ecboline only. After separation of this alkaloid, the ergotine is precipitated by phosphomolybdic acid, the phosphomolybdate is then decomposed by carbonate of barium in the presence of water, and after filtration the liquid, containing the ergotine, is evaporated to dryness in a water-bath. Wenzell's ergotine has the appearance of brownish black shining varnish. It is soluble in water and in alcohol, but insoluble in ether. It is very slightly active, as has been mentioned; ecboline, on the contrary, would represent four times its weight of ergot.

The study of these three products, so different in their mode of preparation and their physiological effects, shows that these ergotines are far from being clearly defined compounds. The ergotine of M. Tanret appears to be a true alkaloid. This chemist first prepares an extract of ergot with boiling 80° alcohol, and from it he obtains by the successive actions of ether, chloroform, sulphuric acid, and alkalies, a body having a very feeble alkaline reaction, but possessing all the other properties of alkaloids. Details of the process of preparation will be found in the *Year-Book of Pharmacy*, 1879.

Ergotinine is a crystallizable alkaloid. It is insoluble in water, and soluble in alcohol, ether, and chloroform. The alcoholic solution is very fluorescent. By the action of concentrated acids in the presence of traces of ether it gives rise to phenomena of coloration. Thus sulphuric acid containing one-seventh part of water causes it to become red, yellow, and then an intense violet-blue. It forms with acids, especially sulphuric and lactic acids, well crystallized salts. Unfortunately it is very unstable, and is found in ergot in very small quantity, the maximum yield per kilogram being 1.20 gram of ergotine, of which only one-third crystallizes. Hence it would not be susceptible of everyday use, although it might be a very powerful hemostatic in cases of uterine hemorrhage.

The author next refers to the investigations of Dragendorff and Podwissotzky, who relegate the ergotines and ergotinine to the second rank, and attribute all the properties of ergot to two acids, a gummy matter, and an alkaloid very different, according to them, from ergotine and ergotinine. Sclerotic acid, obtained, like scleromucin, from the aqueous extract, is soluble in water, 45° alcohol,

and boiling 75° alcohol. It is a body with a very energetic action, a subcutaneous injection of it rapidly causing paralysis in frogs, with swelling of the abdomen. Fuscosclerotic acid is insoluble in water and in ether. It dissolves in acid menstrua, and is prepared by treating the colouring matter of ergot with alcohol acidulated with tartaric acid. It appears to act specially upon the sensibility, which it diminishes promptly. Scleromucin is a viscous, colloidal matter, soluble in water and insoluble in alcohol. It is nitrogenous and very rich in mineral substances (26·8 per cent.). Although very impure and badly defined, it appears to be the therapeutic agent of ergot. Picrosclerotine is a very bitter alkaloid, which is removed from the colouring matter at the same time as fuscosclerotic acid. It is not soluble in acidulated water. This alkaloid is the most toxic agent in ergot. Injected in the dose of one milligram under the skin of a frog, it produces at first insensibility, followed by paralysis of the extremities, and causes death in less than ten minutes.

Summing up the results of all these investigations, the author arrives at the conclusion that chemists are not yet properly acquainted with the active principle or principles of ergot. Not one of the bodies isolated, alkaloid or acid, gummy or colouring matter, can replace in therapeutics the drug itself; and it would appear that it only remains to admit, with Bonjean and Buchheim, that ergot owes its medicinal properties to the whole of its chemical constitution. Consequently the medical man should always employ ergot in its natural state, powdered, and the powder should always be recently prepared. Under this form it could be rendered more active and probably less alterable by removing the 35 per cent. of fixed oil, by exhausting it, for example, with carbon bisulphide.

For hypodermic injections choice should be made, among the preparations soluble in water, of that which would be at the same time the most active and the most stable, the easiest to prepare and the most apt to lend itself to dispensing. This choice is rendered easy by the small number of preparations in which these conditions are to be found, this being the case with three only, viz., the fluid ergotine of Postans, the liquid extract of Yvon, and the ergotine of Bonjean.

For the preparation of Postans' fluid ergotine, the powdered ergot is macerated during eight days in a mixture of water, alcohol, and glycerine. At the end of this time it is passed through a filter, and the filtered liquor freed from alcohol by distillation. The ergot remaining on the filter is then exhausted by displacement with water, and this aqueous solution is concentrated in a water-bath in

a tared capsule until the weight of the liquid equals the weight of the ergot employed, and then filtered. A fluid extract is thus obtained which represents its own weight of ergot.

Yvon's liquid extract is prepared also to represent its own weight of ergot, but the method is based upon the investigations of Wiggers, Wenzell, and Tanret in treating the ergot with an acid menstruum. The ergot is pulverized, freed from fatty matters by carbon bisulphide, and then dried in the open air in the shade until all the odour has disappeared. It is next treated by displacement with water acidulated with four parts per thousand of tartaric acid, the acid liquor is heated to coagulate albuminoid matters, reduced in a water-bath to one-third, allowed to cool, and filtered. The filtered liquor is digested with freshly precipitated carbonate of lime, again filtered, and brought to the consistence of a syrup, to which is added 92° alcohol. The alcoholic liquid is filtered, decolorized by animal charcoal, again filtered, then submitted to distillation or evaporation to drive off the alcohol. Finally the residue is taken up with distilled water, 15 centigrams of salicylic acid added for each 100 grams of ergot, and sufficient distilled water or cherry-laurel water to have 100 grams of liquid for each 100 grams of ergot. It is then allowed to deposit afresh, filtered, and preserved in small well-closed flasks.

Yvon's extract is a liquid having an amber colour and a peculiar odour; it gives all the reactions of alkaloids. It lends itself well to the preparation of hypodermic injections, and according to the inventor keeps well. The product is open, however, to the objection of want of homogeneity, its activity varying exactly with that of the ergot, and so especially is the long and unpractical mode of preparation. Yvon's process is a laboratory process, which could never be followed in the ordinary course in pharmacies, especially in country places.

Bonjean's ergotine is, therefore, the preparation to which recourse should be had in the majority of cases; it being, when well prepared, a valuable and reliable remedy. The preparation of this extract not being mentioned in the Codex has been dealt with rather arbitrarily. Few extracts have been so much studied during recent years, but it will suffice to mention the memoirs of Deschamps, Dorvault, Carles, Lepage, Patrouillard, and Catillon. To all the processes indicated, the author prefers that of Bonjean, modified in the direction indicated by Lepage and the Bordeaux Society of Pharmacy.

Taking a kilogram of ergot, for example (fresh and undried, if this be possible), it is reduced to a coarse powder and placed in a

bottle of five litres capacity; the bottle is filled with distilled water, closed, and shaken frequently. At the end of twenty-four hours, after allowing it to deposit during the night, the liquid is decanted or siphoned, and its evaporation commenced in a tared vessel in a water-bath. The bottle is refilled with distilled water, and again shaken; then, after a maceration of six hours, the liquor is decanted and added to the previous product. Another litre of water is added to the ergot and left in contact during two hours; then the whole is thrown on a strainer and pressed. The third liquor is added to the other two, and the whole is evaporated rapidly until reduced to about 500 grams. It is now allowed to cool to 50° C., and poured into a litre flask; the dish is rinsed with a little 92° alcohol, which is added to the other liquid, and the flask is completely filled with strong alcohol, after which it is closed, shaken, and placed in a cool place. After twenty-four hours the liquid is filtered through paper, and the filtrate is evaporated in a water-bath to the consistence of a firm extract. A yield of about 8 per cent. of ergotine is thus obtained.

This ergotine is of a red-brown colour, and has a smell like that of roast meat; its taste is bitter and piquant. It contains 10 per cent. of water, and leaves 6 per cent. of salts upon incineration. It dissolves nearly completely in water, and this solution is facilitated by first suspending the extract in a little glycerine. It is soluble in 60° alcohol.

Ergotine should be preserved in well-closed flasks. It should never be used too old; there would therefore be an advantage in preparing it every year or every two years at least. After a time it forms crystalline deposits of a salt which, according to Flückiger, is an acid phosphate of sodium and magnesium, with a little sulphate.

For hypodermic injections, ergotine is used in doses of 1 to 2 grams dissolved in distilled water, cherry-laurel water, or a mixture of distilled water and glycerine, the precaution being taken to first suspend the ergotine in the glycerine, adding the water, and filtering through moistened paper to obtain very clear solutions. These solutions are made sometimes 1 in 5 (Dr. Vidal), sometimes 1 in 10, or 1 in 15 (Dr. Bucquoy and Dr. Montard-Martin).

Subcutaneous injections of ergotine are occasionally painful, either when a badly prepared alcoholic extract or a solution slightly alcoholic has been used, or an ergotine containing lactic acid, due, according to Buchheim, to the lactic fermentation of the mycose.

The conclusions from a chemical and pharmaceutical point of

view are easily deduced. When the medical man can, he should administer the pulverized ergot, were it even in suspension in a julep, and that in preference to all the ergotines. For hypodermic injections, he should use for the present the ergotine of Bonjean.

Behaviour of Starch towards Glycerin. K. Zulkowsky. (*Zeitschr. des oesterr. Apoth. Ver.*, 1880, 483.) When 60 grams of starch are gradually heated with 1000 grams of glycerin to 190° C. with continual stirring, the starch becomes completely converted into the soluble modification. Upon the subsequent addition of water to the resulting solution, any unaltered starch still present is thrown down, while the soluble starch remains in solution and may now be precipitated by means of strong alcohol. The product thus obtained is soluble in water, and even in dilute alcohol, and leaves upon evaporation of the solution a colourless, brittle, glass-like residue which is not again soluble in water. The aqueous solution is strongly dextro-rotatory, and is rendered intensely blue by iodine.

Absorption of Moisture by Glycerin. G. E. Williams. (*Amer. Journ. Pharm.*, October, 1880.) The property possessed by glycerin of absorbing moisture is well known. To determine its rapidity under different circumstances, the following experiments were undertaken:—

1. 100 grams of glycerin, sp. gr. 1.25, were placed in each of four vessels of about the capacity of 200 c.c. and of the diameters given in the table. These vessels were placed in the damp atmosphere of the cellar, September 1st, and weighed monthly.

| Dia- meter. | Weight in Grams. | | | | Monthly Increase, per cent. | | | |
|----------------|------------------|---------|---------|---------|-----------------------------|------|------|------|
| | Oct. 1. | Nov. 1. | Dec. 1. | Jan. 1. | Oct. | Nov. | Dec. | Jan. |
| Cm. | | | | | | | | |
| 2.5 | 102 | 103.7 | 103.8 | 104.1 | 2.0 | 1.7 | .1 | .3 |
| 5.0 | 116 | 118 | 119.25 | 122 | 16 | 2 | 1.25 | 2.75 |
| 7.5 | 135 | 138.5 | 142.7 | 147.5 | 35 | 3.5 | 4.2 | 4.8 |
| 10.0 | 150 | 152.7 | 155.25 | 158.5 | 50 | 2.7 | 3.25 | 3.25 |

2. 100 grams of glycerin, sp. gr. 1.25, in a vessel 5 cm. in diameter and of 200 c.c capacity, and 100 grams of distilled water in another vessel of the same size and shape, were placed in a large jar, which was then closely covered. On weighing the vessels monthly, the glycerin had increased and the water decreased, as shown by the table:—

| Weight. | | | |
|-------------------|---------|---------|---------------|
| Oct. | Nov. | Dec. | Jan. |
| Glycerin, 108 gm. | 112 gm. | 114 gm. | 115.7 gm. |
| Water, 90 " | 82.5 " | 75.5 " | 68.3 " |
| Oct. | Nov. | Dec. | Jan. |
| Increase, 8- | 4- | 2- | 1.7 per cent. |
| Decrease, 10- | 7.5 | 7- | 7.2 " |

Relation of the Strength of Solutions of Glycerin to their Specific Gravities. W. Lenz. (*Zeitschr. für Analyt. Chem.*)

| Percent. of Anhydrous Glycerin. | Sp. Gr. at 12-14° C. | Percent. of Anhydrous Glycerin. | Specific Gravity of 12-14° C. | Percent. of Anhydrous Glycerin. | Sp. Gr. at 12-14° C. |
|---------------------------------|----------------------|---------------------------------|-------------------------------|---------------------------------|----------------------|
| 100 | 1.2691 | 67 | 1.1795 | 34 | 1.0890 |
| 99 | 1.2664 | 66 | 1.1764 | 33 | 1.0852 |
| 98 | 1.2637 | 65 | 1.1733 | 32 | 1.0825 |
| 97 | 1.2610 | 64 | 1.1702 | 31 | 1.0798 |
| 96 | 1.2584 | 63 | 1.1671 | 30 | 1.0771 |
| 95 | 1.2557 | 62 | 1.1640 | 29 | 1.0744 |
| 94 | 1.2531 | 61 | 1.1610 | 28 | 1.0716 |
| 93 | 1.2504 | 60 | 1.1582 | 27 | 1.0689 |
| 92 | 1.2478 | 59 | 1.1556 | 26 | 1.0663 |
| 91 | 1.2451 | 58 | 1.1530 | 25 | 1.0635 |
| 90 | 1.2425 | 57 | 1.1505 | 24 | 1.0608 |
| 89 | 1.2398 | 56 | 1.1480 | 23 | 1.0580 |
| 88 | 1.2372 | 55 | 1.1455 | 22 | 1.0553 |
| 87 | 1.2345 | 54 | 1.1430 | 21 | 1.0525 |
| 86 | 1.2318 | 53 | 1.1403 | 20 | 1.0498 |
| 85 | 1.2292 | 52 | 1.1375 | 19 | 1.0471 |
| 84 | 1.2265 | 51 | 1.1348 | 18 | 1.0446 |
| 83 | 1.2238 | 50 | 1.1320 | 17 | 1.0422 |
| 82 | 1.2212 | 49 | 1.1293 | 16 | 1.0398 |
| 81 | 1.2185 | 48 | 1.1265 | 15 | 1.0374 |
| 80 | 1.2159 | 47 | 1.1238 | 14 | 1.0349 |
| 79 | 1.2122 | 46 | 1.1210 | 13 | 1.0322 |
| 78 | 1.2106 | 45 | 1.1183 | 12 | 1.0297 |
| 77 | 1.2079 | 44 | 1.1155 | 11 | 1.0271 |
| 76 | 1.2042 | 43 | 1.1127 | 10 | 1.0245 |
| 75 | 1.2016 | 42 | 1.1100 | 9 | 1.0221 |
| 74 | 1.1999 | 41 | 1.1072 | 8 | 1.0196 |
| 73 | 1.1973 | 40 | 1.1045 | 7 | 1.0172 |
| 72 | 1.1945 | 39 | 1.1017 | 6 | 1.0147 |
| 71 | 1.1918 | 38 | 1.0989 | 5 | 1.0123 |
| 70 | 1.1889 | 37 | 1.0962 | 4 | 1.0098 |
| 69 | 1.1858 | 36 | 1.0934 | 3 | 1.0074 |
| 68 | 1.1826 | 35 | 1.0907 | 2 | 1.0049 |
| 67 | 1.1795 | 34 | 1.0880 | 1 | 1.0025 |

The Preparation of Cinchona Wine and the Estimation of the Percentage of Alkaloid therein. Dr. C. Schacht. (*Chem. and Drugg.*, from *Archiv der Pharm.*, xiv., 81.)

Preparation of the Wine.—The author found that, while the

liquid resulting from extracting cinchona bark with acidulated ordinary sherry (which, as is known, contains from 16 to 17 per cent. of absolute alcohol) sooner or later turns muddy upon keeping, this was not the case when the sherry had been previously alcoholized by adding to it 20 per cent. of alcohol of a specific gravity of 0.83. A cinchona wine was made by treating 5 grams of the best cinchona (calisaya) bark with 80 grams of sherry, to which 20 grams of alcohol of sp. gr. 0.83 had been added, and acidulating with 20 drops of pure hydrochloric acid of a specific gravity of 1.124, the whole being digested 8 days at a moderate temperature, and frequently shaken up. Upon adding to this extract syrup of orange peel, in the proportion of 5 parts of the latter to 15 parts of extract, a cinchona wine is obtained of a reddish brown colour, a pleasant bitter taste, and fragrant odour, and which is quite clear, and keeps so. Since this wine is only given in small doses, and never alone, the large percentage of alcohol in a wine of the kind is of no import.

Determination of the Percentage of Alkaloid in the Wine.—100 grams of the quinine wine to be operated upon are diluted with 200 grams of distilled water, 10 grams of diluted sulphuric acid, of a specific gravity of 1.115, are then added, and the mixture precipitated with 150 grams of a cold saturated aqueous solution of picric acid. After allowing it to settle, the precipitate is placed upon a filter and washed from this with as little water as possible into a bottle of 100 c.c. capacity, 10 c.m. long, and 4 c.m. wide, furnished with a glass stopper, and containing about 5 grams of an aqueous solution of ammonia. The filter is rinsed out with a small quantity of a mixture of ether and chloroform, and the bottle then completely filled with this mixture. The whole is then thoroughly shaken up, and the lower layer separated by means of a separatory funnel. The process of exhausting with a fresh quantity of chloroform and ether is twice repeated, and then the chloroform and ether expelled by distilling over a water-bath. The residue is dissolved in absolute alcohol, and the solution again placed in the bottle above mentioned, and therein treated with a small quantity of an aqueous solution of ammonia, petroleum ether being then added. Since the latter takes up only small quantities of quinine, the process of exhausting must be repeated six or eight times, which, however, occasions very little time or trouble. This petroleum ether, which contains the quinine, is, before putting it into a distilling-flask of about a litre capacity, first filtered through a small dry filter, in order to remove every trace of colouring matter

and moisture. A too strong solution of quinine in petroleum ether must be avoided, since a solution of the kind would even during the process of distillation deposit the quinine as a gelatinous mass. It is, therefore, advisable to have as dilute a solution as possible, from which, after distilling and allowing to cool, the quinine deposits in scales and nuclei. The quinine deposited from the petroleum ether solution is dissolved in absolute alcohol, and the solution placed in a glass dish previously weighed, in which it is allowed to evaporate spontaneously in a strong current of air. The residue is then dried at a temperature of $120^{\circ}\text{C}.$, and weighed.

Note on Pepsin. L. E. Sayre. (*Amer. Journ. of Pharm.*, Jan., 1881.) Referring to the preparation of pepsin, the author states that, before any admixture of sugar of milk is made, the pepsin should be thoroughly dried, as otherwise an incipient fermentation is induced, which causes a decrease of digestive power in the product.

The Preparation of Pepsin. A Petit. (*Journ. de Pharm. et de Chim.* [5], ii., 85. From *Pharm. Journ.*) The first part of this valuable paper contains a summary of all the principal processes for the preparation of this substance, while the second gives the results of a critical examination of these processes. Owing to the importance of the subject, and the non-suitability of the paper for useful abstraction, we reproduce it almost *in extenso*.

Wasmann's Process.—Wasmann gave the first process for the extraction of pepsin in 1839. The mucons portion of a pig's stomach is first washed during several hours in distilled water at the temperature of $30\text{--}35^{\circ}\text{C}.$, and then allowed to macerate in the water until it commences to develop a fetid odour. The liquid after filtration is precipitated with acetate of lead, and the precipitate is washed, suspended in water, and decomposed by a current of sulphuretted hydrogen. The liquid is then filtered and evaporated to the consistence of a syrup, and an excess of alcohol added which precipitates the pepsin.

Vogel's Process.—The pepsin obtained by the process of Wasmann is several times redissolved in water and reprecipitated by alcohol in order to obtain it in a state of greater purity.

Bidder and Schmidt's Process.—The gastric juice is neutralized with lime water, and the filtered liquor is evaporated to the consistence of a syrup, and precipitated by alcohol. The precipitate is redissolved in alcohol and reprecipitated by a great excess of mercury bichloride; the mercury is eliminated by a current of sulphuretted hydrogen, and the solution separated from the sulphide of mercury is evaporated to dryness.

Deschamps d'Avallon's Process.—In saturating the free acids of calf's rennet with ammonia, Deschamps d'Avallon precipitated the syntonine held in solution, which carried with it a portion of the pepsin. It was to this substance that he gave the name "chymosine."

Payen's Process.—Payen added to the filtered gastric juice of a dog ten to twelve times its weight of alcohol. The precipitate was re-dissolved in water and again precipitated by alcohol. Payen called this product "gasterase."

Mialhe's Process.—M. Mialhe demonstrated in 1846 that there existed in the gastric juice a digestive ferment, and that the pepsin of Wasmann, the chymosine of Deschamps d'Avallon, and the gasterase of Payen are identical with each other, and constitute one and the same principle. He proposed to extract the pepsin either from the gastric juice itself, or from the liquids (rennets) in which the mucous membrane of the stomach is put to macerate, a suggestion which was much more practical, and allowed of the obtaining of a commercial product possessing considerable activity.

Wittich's Process.—Brücke recommended to digest at a temperature of 38°, in dilute phosphoric acid, the mucous portions of a pig's stomach until completely disaggregated. The liquid after filtration should be limpid, and should no longer be precipitated by ferrocyanide of potassium. After having added lime-water to nearly complete neutralization, the precipitate of phosphate of lime, which has carried down the pepsin with it, is collected. This is again dissolved in water containing hydrochloric acid and precipitated by lime-water. It is then dissolved in dilute hydrochloric acid, filtered, and to this new solution is added cholesterine dissolved in the cold in a mixture of four parts of 94° alcohol and one part of ether. The cholesterine soon rises to the surface, carrying with it the pepsin, which is fixed upon it. The whole is collected upon a filter, washed first with dilute hydrochloric acid, then with water, and shaken with ether, which dissolves the cholesterine, whilst the water adherent to the precipitate is charged with the pepsin. It only remains to evaporate this water at a moderate temperature to obtain the pepsin pure.

Process of the French Codex (1867).—This process, which closely resembles that of Wasmann, consists in taking a number of stomachs of freshly killed sheep, emptying and washing them rapidly, and then tearing away the internal membrane by beating them sharply with a brush of couch grass. The pulp which results is macerated during two hours only in water at a temperature of 15° C.,

then the whole is thrown upon a coarse strainer, and to the liquid that passes through, but unfiltered, a solution of neutral acetate of lead is added. The precipitate which forms is very abundant. The supernatant liquid is decanted and replaced twice with distilled water. The precipitate is suspended for the last time in water through which a current of sulphuretted hydrogen is passed until excess is manifest. The liquid and the black precipitate are distributed upon a number of filters, and the filtered liquid is evaporated as rapidly as possible in deep vessels, exposing only a small surface at a temperature not exceeding 45°C . When dry the product is removed by means of a flexible knife, and presents the form of a firm paste of a light colour, slightly acid taste, and with a special odour that is not at all putrid.

Process of the British Pharmacopœia.—The stomach of a pig, calf, or sheep, is carefully washed, the mucous membrane thus cleansed is scraped, and the viscous matter so obtained is spread out and rapidly dried at a temperature not exceeding 100°F ., or 37°C . The dry product is pulverized.

Scheffer's Process.—This process consists in macerating in water acidulated with hydrochloric acid, with frequent agitation, during several days, the mucous membrane of a pig's stomach, carefully cleaned and cut into small pieces. If after filtration the liquid is not clear, it is allowed to stand twenty-four hours. An equal volume of a saturated solution of chloride of sodium is then added to the clarified liquor. After several hours the pepsin, separated by the chloride of sodium, floats to the surface, from whence it is removed with a spoon and deposited upon a calico filter, which is finally submitted to pressure to remove as much as possible of the saline solution.

Petit's Process.—The stomachs of pigs, calves, or sheep are carefully washed with water, and the mucous membrane, separated by scraping with a rounded knife, is cut as small as possible and put to macerate in four times its volume of distilled water, to which is added five per cent. of alcohol. The mixture is agitated every half-hour. After four hours' maceration the liquor is filtered and evaporated at a temperature not exceeding 40°C ., in vessels exposing a large surface and in a well-ventilated place, so that a renewal of the atmosphere takes place readily.

Comparative Examination of the Various Processes for the Preparation of Pepsin.—In presence of such various processes given by authors and recommended in pharmacopœias, it was indispensable to prepare pepsin by following them exactly. It was necessary, also,

that the conditions of experiment should be absolutely comparable. This was attained by operating upon the same liquids or upon the same mucous membranes. Each process has been repeated several times in order to be sure of the exactitude of the results obtained.

The process of Wasmann presents the inconveniences noticed lower down in speaking of the process of the French Codex, besides that which results from precipitation by an excess of alcohol.

Precipitation by alcohol only allows of the separation of a portion of the digestive power.

Vogel's process is still more defective, since the pepsin is submitted to several precipitations by alcohol.

The processes of Bidder and Schmidt, Deschamps d'Avallon and Payen cannot be used for the preparation of medicinal pepsin, and have yielded bad results.

In Brücke's process the carrying down of a soluble substance by means of a precipitate would appear likely to leave in solution a large part of the active principle. This is in fact what takes place. The phosphate of lime precipitate does, however, carry down a large proportion of the pepsin; but in following the process to the letter, and washing the cholesterine to which the pepsin adheres, first with acidulated hydrochloric acid and then with pure water, it is very evident that the pepsin should all be dissolved. Consequently the aqueous liquid that separates in the treatment of the moist cholesterine with ether contains only traces of the digestive principle.

This process repeated three times yielded as a definite result insignificant quantities of a product containing more or less phosphate of lime.

In treating by this method five grams of excellent pepsin, the author obtained only a few centigrams of slightly active product.

Although this process cannot be employed in the preparation of commercial pepsin, attention has been called to it because it has been indicated as an excellent method of preparing pepsin in a state of great purity. According to Brücke, his pepsin would not be a nitrogenous body. It is nearly certain that he had not pure pepsin at his disposal, but foreign substances retaining a certain proportion of pepsin. The author has ascertained that a pepsin converting into peptone one thousand times its weight of fibrin, and giving when moderately calcined 17 per cent. of ash, contained in a first estimation 10.80 per cent. of nitrogen, and in a second 11.40 per cent., or a mean of 11.10. Taking account of the ash, this would be 13.37 per cent. of nitrogen, which approaches closely to the composition of albuminoid substances.

It appears, therefore, that the process of Brücke ought to be rejected, even for the purposes of research, where it would only be required to prepare small quantities of pure pepsin.

It now remains to discuss the five following processes:—Maceration of the mucous portion of the stomach in water and precipitation by alcohol, the French Codex process, the British Pharmacopœia process, the American process of Scheffer, and the author's own process.

In each experiment 25 grams of water, containing 3 grams of HCl per litre, were added to 5 grams of fibrin, and heated twelve hours at 50° C. in presence of variable quantities of pepsin. By afterwards adding nitric acid drop by drop to the filtered liquid, it was ascertained whether the transformation into peptone was complete, or more or less advanced. The results are indicated by the figures given below, which were obtained in operating upon pigs' stomachs.

Yield.—550 grams of liquid from the same maceration gave by—

| | Grams. |
|--|--------|
| Codex process | 1.10 |
| Precipitation by 3 volumes of alcohol | 3.50 |
| Precipitation by 10 volumes of alcohol | 3.50 |
| Petit's process | 5.70 |

Activity.—These products employed and tested as described gave the following results:—

| Method of Preparation of Product used. | Quantity used. | Result when Tested with Nitric Acid. |
|--|----------------|--------------------------------------|
| Precipitated by 3 vols. of alcohol | 0.30 gr. | Abundant precipitate. |
| " " 10 " " | 0.30 " | Abundant precipitate. |
| Codex process | 0.20 " | Clear liquid. |
| " " " " | 0.10 " | Abundant precipitate. |
| Petit's process | 0.01 " | Clear liquid. |

In a second series of experiments the yield was,—

| | Grams. |
|---|--------|
| Codex process | 0.22 |
| Scheffer's process | 11.00 |
| Precipitation by 3 vols. of alcohol | 3.50 |
| Petit's process, without filtration | 6.80 |
| Petit's process, with filtration | 3.25 |

These products upon testing gave the following results:—

| Method of Preparation of Product used. | Quantity used. | Result when Tested with Nitric Acid |
|--|----------------|-------------------------------------|
| Codex process | 0.10 gr. | Very abundant precipitate. |
| Scheffer's process | 0.10 " | Clear liquid. |
| Precipitation by 8 vols. of alcohol | 0.10 " | Very abundant precipitate. |
| Petit's process, without filtration | 0.01 " | Clear liquid. |
| Petit's process, with filtration . | 0.005 " | Clear liquid. |

The Codex process gives, as will be seen, variable quantities of pepsin, of which the activity is very inferior.

By Scheffer's process an active product can be obtained, but the pepsin so prepared contains more or less chloride of sodium. In the foregoing case there was left upon calcination four-fifths of saline residue. Twice the author obtained good results by adding the chloride of sodium to the unfiltered liquors; but when the liquor was filtered, as recommended by Scheffer, the product was much less active.

The process of the British Pharmacopœia, compared with the author's, gave a nearly identical yield, but the pepsin so obtained was more impure, less soluble, and less active.

| Method of Preparation of Product used. | Quantity used. | Result when Tested with Nitric Acid. |
|--|--------------------|--------------------------------------|
| British Pharmacopœia | 0.05 gr. | Clear liquid. |
| Petit's process | 0.01 and 0.005 gr. | Clear liquid. |

It is very generally believed that water is a bad solvent of pepsin. This is an error already combated by Witt. The mucous portion of the stomach yields as much pepsin to simple water as to acidulated water or glycerin. Comparative experiments have shown to me that the liquors acidulated with hydrochloric acid are inferior in activity to those prepared with water only.

Some mucous membranes were separated from the muscular coats, cut fine, and mixed. Equal weights of this mixture were macerated in equal volumes of (1) water; (2) water containing 5 per cent. of alcohol; (3) water containing 5 grams of true hydrochloric acid per litre. After macerating the same time, a test of artificial digestion gave the following results:—

| | | |
|----------------------------|--------------------|------------------------------|
| Aqueous liquor | $\frac{1}{2}$ c.c. | Rather abundant precipitate. |
| " " | 1 " | Clear liquid. |
| Alcoholic liquor | $\frac{1}{2}$ " | Turbid liquid. |
| " " | 1 " | Clear liquid. |
| Hydrochloric liquor 1 " | | Rather abundant precipitate. |
| " " 2 " | | Turbid liquid. |

Following his own process in the preparation of calves' and sheep's pepsin, the author obtained the following results:—

| | | |
|---------------------------------|----------|----------------|
| Calves' pepsin, Filtered liquor | 0.10 gr. | Clear liquid. |
| " " " " | 0.05 " | Precipitate. |
| " " Unfiltered liquor | 0.20 " | Clear liquid. |
| " " " " | 0.10 " | Precipitate. |
| Sheep's " Filtered liquor | 0.05 " | Clear liquid. |
| " " " " | 0.025 " | Turbid liquid. |
| " " Unfiltered liquor | 0.10 " | Clear liquid. |
| " " " " | 0.05 " | Precipitate. |

The Codex process, tested with the same quantity of sheep's stomach, gave—

| Yield. | | | |
|----------------------------------|---|------------|---------------|
| Petit's process | . | . | 10.30 gram. |
| Codex process | . | . | 2.50 " |
| Activity. | | | |
| Petit's process, filtered liquor | . | 0.05 gram. | Clear liquid. |
| Codex process | . | 0.50 " | Precipitate. |

The above results show that it is easy to prepare pepsins of great activity.

With fresh pigs' stomachs that have not undergone any alteration, taking the most minute precautions during the evaporation, the author has succeeded in preparing pepsins converting into albuminose one thousand times their weight of well dried fibrin.

With sheep's stomachs the activity of the pepsin prepared is about one-tenth.

Previous experiments relative to the solution of fibrin (see *Pharm. Journ.*, 3rd series, x., 584) have established the fact that there exists an absolute difference between the solution of fibrin and its conversion into albuminose, and that pepsins which only dissolve ten times their weight of fibrin will no longer be considered good. With the most active pepsin prepared by the author's own process, he has not been able to obtain in seven hours the solution of five hundred thousand times its weight of fibrin. The contents of several comparison flasks, placed in the same conditions, were not liquefied, and had preserved their gelatinous appearance. In making comparative experiments it is necessary to take the greatest care not to introduce into the flask the least trace of pepsin, however small.

It may further be useful to add, that by prolonged exposure in the stove, acidulated water alone would determine the more or less complete solution of the fibrin.

Antiseptic Properties of Species of *Strychnos* and their Alkaloids. Prof. C. Pavesi. (*Pharm. and Chem.*, 1880, 432, from *Bolletina Farmaceutica*.) The author has observed that solutions of the salts of brucine and strychnine possess, in an eminent degree, an antiseptic and antifermentative power. Meat of any source immersed in a solution of sulphate of strychnine or brucine, and left there for months at a temperature of 16–18° C., remains fresh and inodorous. Removed from the solution and dried, it becomes very hard and bitter, because the molecules of the alkaloid have penetrated every part of the tissue. A solution of the alkaloids added to milk, though the latter separates into its liquid and solid constituents, prevents it from further decomposition. Its action upon urine is quite prompt, producing, after a few hours, at a temperature of 15–16° F., a mucous saline deposit floating about in a straw-yellow liquid, without any trace of decomposition or development of ammonia. The same effects were obtained when experimenting upon blood, albumen, gelatin, honey, sugar, grain, leguminous seeds—which latter are prevented from germinating, and bitter almonds and mustard, which, if first deprived of fixed oil, are deprived of the power of developing essential oil.

All members of the *Strychnos* family, particularly the *St. Ignatius' Bean* and *Nux Vomica*, are used in tropical countries as remedies; but, singularly enough, only against fevers and poisonous bites. The effectiveness of the remedy in these diseases may possibly be owing to the antiseptic and antifermentative power of the alkaloids. The seed of the species *Strychnos Potatorum*, L., which is common in India, and is known as "clearing nut," is used for clarifying impure or muddy water, by rubbing with it the interior of unglazed drinking vessels. The author thinks it possible that the antiseptic effects of these seeds are likewise due to the presence of strychnine.

Utilization of Rhubarb Residues for the Preparation of Chrysophanic Acid. Prof. Stöder. (*Pharm Journ.*, 3rd series, xi., 111.) The press residues from the preparation of *syrupus rhei* afford a cheap source of chrysophanic acid, which the author extracts from it in the following manner:—The dried residue reduced to powder is treated in a displacement apparatus with benzol until the benzol passes through colourless, when the greater part of it is distilled off. The concentrated liquid is decanted from the separated emodin, evaporated in a water-bath nearly to dryness, and the residue again carefully extracted with hot benzol. Upon evaporation and cooling of the liquid the chrysophanic acid crystallizes out, and is purified

by recrystallization from spirit. By this process the author claims to have obtained a yield of .9 per cent. of crystallized acid.

Bornträger's Aloes Test. R. H. Groves. (From a paper read before the School of Pharmacy Students' Association; *Pharm. Journ.*, 3rd series, xi., 1045.) This test, which will be found described in the *Year-Book of Pharmacy*, 1880, p. 140, has been examined by the author with the object of ascertaining to what extent it affords reliable indications with the different varieties of aloes, and what share, if any, aloin might have on the reaction. The results of his experiments lead to the following conclusions:—

1. That the test cannot be depended upon unless the proportion of aloes in the solution exceeds 1 part in 250; and that in the case of Natal aloes it fails with solutions containing less than one per cent.

2. That the colour reaction is not due to aloin, and if due to a tannin-like substance, it must be a variety which is soluble in benzene.

3. That extreme care must be taken when employing this test for the detection of aloes that the benzene layer is perfectly clear before decanting from the underlying liquor.

A New Method of Pill-coating. M. Ditten. (*Journ. de Pharm. d'Alsace Lorraine*, viii., 53.) The pills to be coated are rolled briskly in melted cocoa-butter on a plate or a flat-bottomed dish; and after this they are shaken with a large proportion of starch powder, and allowed to cool. This coating protects the pills from all influences of air and moisture, and prevents evaporation of volatile ingredients. Pills so coated are said to possess in some degree the pleasant aroma of chocolate, and to readily disintegrate in the stomach.

Emulsions. E. G. H. Graff. (Abstract of an Inaugural Essay. *Amer. Journ. of Pharm.*, June, 1881.)

CLASS I. *Emulsions of Oils, Liquid Balsams, Oleo-resins, Resinous Fluid Extracts, and Tinctures.*

These substances are generally emulsified by means of gum arabic; but occasionally use is also made of yolk of egg, tragacanth, and tincture of soap bark.

(a) *Gum Arabic.*—The author reviews and criticises the various methods of manipulation in use for emulsifying these substances with gum arabic, and states, as the result of his experience, that emulsification is best performed by triturating one part of the pure powdered gum with two or more parts of the oil or other body to be emulsified; then adding two parts of water at once, stirring briskly

until the emulsion is formed; and lastly, adding the remainder of the water by degrees. The proportion of water should always be two parts to one of gum, irrespective of the quantity of oil used. The relative quantities of gum arabic and oil are in their best proportions when two parts of the oil are emulsified with one part of gum arabic. The clicking sound which is heard when an emulsion is nearing its completion, and which is the most certain sign of having succeeded, is loudest when the ingredients have been used in this proportion.

(b) *Gum Tragacanth*.—In using gum tragacanth for emulsification, the author adopted a plan somewhat different from that which is followed when gum arabic is the binding medium. He triturated one-twelfth part of the gum with one part of water, then added two parts of oil together with another part of water, and stirred until the emulsion was formed. This method of manipulating gave very satisfactory results.

Gum tragacanth is, however, not often employed, but would be a well-adapted binding medium for a 50 per cent. emulsion of cod liver oil and similar preparations, in which large quantities of oil are desired to be emulsified with as small a quantity of gum as possible.

(c) *Yolk of Egg*.—This substance is also seldom used. In the preparation known as St. John Long's liniment, this binding medium is employed, and is well adapted for emulsifying oil of turpentine, because the fixed oil of egg combines with the essential oil of turpentine, and in this way renders emulsification easier.

(d) *Tincture of Soap Bark*.—The attention of the profession has in the last two years very frequently been called to the emulsifying properties of this tincture, though this preparation was occasionally used for the formation of emulsions since 1850. All the emulsions made by means of tincture of soap bark separate in two layers, which are, however, easily and thoroughly mixed on agitation.

CLASS II. *Emulsions of Semi-liquid and Solid Balsams, Solid Fats and Camphors.*

This class of emulsions is not an important one.

On the Continent of Europe and in England pharmacists are sometimes called upon to prepare emulsions of wax, spermaceti, and butter of cacao, for lotions for the hands, etc. These fats are emulsified by melting in a mortar one part, triturating it with one part of gum arabic, and then adding gradually one part and a half of water of a temperature of 90–95° C., and stirring until thoroughly combined. After cooling, the emulsion is to be diluted very carefully to the desired extent.

This operation is greatly facilitated by the addition of a small quantity of borax, and if the preparation is intended for a lotion, this addition is a very good one, not only on account of its cleansing properties, but also because borax coagulates a mucilage of gum arabic, and consequently gives the preparation more body and stability. One scruple of borax is sufficient for one fluid ounce of emulsion.

In the same way as solid fats, the semi-liquid and solid balsams may be emulsified. Sometimes they are dissolved in alcohol, ether, chloroform, or other solvents, and then they would have simply to be treated as the substances mentioned under Class I.

Camphor is either emulsified by dissolving it in the smallest possible quantity of alcohol or olive oil, and then treating it as belonging to Class I.; or by rubbing one part very finely pulverized camphor with ten parts of gum arabic and sugar, and then adding water gradually.

Under this class might yet be mentioned an emulsion of phosphorus. This is dissolved in a mucilage of gum arabic with the aid of heat, and is then easily divided. It would, however, be much more proper to administer this powerful drug by emulsifying oleum phosphoratum.

CLASS III. *Emulsions of Gum-resins.*

These preparations, of which a few are official in the U. S. P. under the name of *misturæ*, are made by simply rubbing the gum-resin reduced to a fine powder with water, and in this way bringing them back again to the state of milky plant-juices, in which they were obtained from nature. The vegetable albumen or gum contained in the gum-resins serves as a binding medium. The only difficulty in making those preparations is the reducing of the gum-resins to a fine powder. By placing the mortar in a hot water bath this operation will be greatly facilitated. After a very fine powder has been obtained, the water is added in small quantities at a time, beating the mass at first, and then stirring, after more water has been added, very briskly, levigating the finest particles, and repeating this operation until nothing except impurities is left. In order to prevent the evaporation of volatile oil which the resins may contain, on placing them in a hot water-bath it is well to sprinkle a little water over them.

CLASS IV. *Emulsions of Resins.*

This class of preparations differs from the foregoing only by the fact that they cannot be made without the addition of a binding medium. They are treated in the same manner as gum-resins,

after having mixed half a part of gum arabic, with the finely divided resin. *Resina jalapæ* and *resina scammonii* cannot be rendered miscible with water by means of gum arabic, except by using from 10 to 20 parts of the latter. A much better plan is to beat the resins into a pulpy mass with a few sweet almonds, deprived of their skins "*via frigida*," and diluting with water.

CLASS V. *Emulsions of Seeds.*

Two methods are examined by the author, and the following declared to be the best:—

The seeds are introduced into a brass, porcelain, or wedgwood mortar, moistened with a little water, and contused with considerable force. Water is added in a small quantity at a time, and after each addition the beating is renewed. The emulsion is to be strained through a white cloth without pressure. The vegetable albumen contained in these seeds serves as a binding medium between their oil and water. Upon the force used and the industry of the operator depends the success of the emulsion, which, when perfect, must have a thick consistency and an opaque white appearance.

Addition of the other Ingredients prescribed with Emulsions.

With regard to this subject the author recommends the observance of the following rules:—

1. Never add to an emulsion hot liquids. This rule is important when, instead of water, the emulsion has to be made with an infusion or decoction; such liquids must be allowed to cool perfectly before using them.

2. When sugar, syrup, extracts, acids, salts, alcohol, and ethereal liquids have to be added, the emulsion is to be diluted previously to the fullest extent possible. Among the salts, the lead or iron salts require the most caution. Acids, tinctures, especially those made with strong alcohol and spirit of nitrous ether, are first diluted with water before adding to emulsions. Borax added to an emulsion made with gum arabic coagulates with the gum to a thick paste. A sufficient quantity of sugar or syrup will dissolve it again.

The most difficult addition to an emulsion is tincture of chloride of iron. By diluting, however, both the tincture and the emulsion to the fullest extent possible, and then adding the diluted tincture in small quantities at a time, even this can be accomplished.

Mucilage of Irish Moss as an Emulsifying Agent. A. B. Husted. (*Oil and Drug News*, May 31st, 1881.) The author's experiments were made with a mucilage prepared according to the following formula:—Take of dry Irish moss the required amount,

wash thoroughly in two or three portions of cold water, put into a suitable dish and pour upon it double the quantity of water to the mucilage required. Apply heat, gradually increasing until the boiling point is reached; continue till the moss is nearly all dissolved and the whole amount reduced to nearly one-half. While still hot pour upon a funnel-shaped wet filter, and allow the mucilage to drain off, without stirring or using pressure. Two drachms of moss to make sixteen fluid ounces of such mucilage was the proportion found to answer best. The addition of three fluid ounces of glycerin to every thirteen fluid ounces of mucilage causes the latter to keep fairly well in securely corked bottles, without decreasing its value as an emulsifier.

The oils experimented with were cod liver and castor oil. The resulting emulsions were satisfactory, but not equal to those made with gum arabic, and certainly more troublesome to prepare.

Detection of Common Resin as an Adulterant in Copaiba. C. Grote. (*Pharmaceut. Centralhalle*, 1880, No. 8.) The copaiba to be tested is heated in a porcelain dish until all the volatile oil is evaporated and a brittle resin remains. A piece of the residual resin, about the size of a pea, is then shaken in a dry test-tube with about 5 c.c. of petroleum ether, and the mixture allowed to stand for several hours; if the sample was pure, any deposit formed will adhere to the sides and bottom of the tube with such tenacity that even vigorous shaking does not detach it. But if the sample was adulterated with common resin, the deposit will not adhere to the glass, and may be readily diffused in the supernatant liquid by shaking, even after the mixture has been standing for days.

Adulteration of some Essential Oils. (*New Remedies*, 1881, 55.)

Oil of Coriander. This is extensively adulterated with colourless rectified oil of orange, which can be detected by its insolubility in 90 per cent. alcohol, in which pure oil of coriander dissolves in every proportion; equal parts of oil of orange and 90 per cent. alcohol make a turbid mixture.

Oil of Bergamot is adulterated with oil of orange. The insolubility of oil of orange, and the solubility of oil of bergamot in 90 per cent. alcohol also furnishes a method of detection in this case.

Oil of Caraway is often mixed with oil of caraway chaff, which again is adulterated with turpentine. Pure oil of caraway dissolves in 90 per cent. alcohol, while it forms a cloudy mixture if adulterated with turpentine. The behaviour to iodine and odour are often sufficient to prove the adulteration.

The Examination of Essential Oils. W. L. Dudley. (*Pharm.*

and *Chem.*, May, 1881, 164-175.) This paper contains a useful summary of the principal and most approved methods of testing volatile oils. The oils treated of are those of anise, bergamot, bitter almonds, cajeput, cinnamon, cloves, copaiba, coriander, erigeron, juniper, lavender, lemon, mustard, peppermint, rose, thyme, and wintergreen. In each case the properties of the pure oil are given together with the best means of recognising such adulterations as have been observed to occur. As the tests recommended are not new, we must confine ourselves here to this notice, and refer the reader to the original.

Preparation of Iodide of Iron Cod Liver Oil. S. D. v. Valkenburg. (*Pharm. Journ.*, 3rd series, xi., 209.)

| | |
|-----------------------------|-------------|
| ℞ Iodii | 1.25 parts. |
| Ferri pulverati | 2.50 „ |
| Ol. Jecor. Aselli | 98.50 „ |

The iodine is thrown into a vessel filled with cod liver oil, and agitated with it for some days until it is dissolved in it, and the liquid after settling has a specific gravity of 0.932-0.937 at 13.5-21° C.

The solution is poured in a vessel which is hermetically shut, and agitated with the powdered iron for about four hours, or until it acquires a purple-violet colour, and ceases to give any indication of free iodine when treated with solution of potassium iodide and starch.

The liquid should now stand quietly for twenty-four hours (the vessel being carefully closed and nearly full), then shaken again for an hour at least, or until it again proves to be free from uncombined iodine on testing it in the same manner as before. The same process is repeated after another twenty-four hours, and again, if necessary, until no further liberation of iodine takes place. This point being attained, the oil is again allowed to settle, and then decanted into bottles of yellow-coloured glass, which must be filled to the top and tightly corked.

The bottles should be no larger than to contain a five days' supply; and no appreciable decomposition need be apprehended during that space of time.

The mixture should be of a purple-violet colour, and have a specific gravity of 0.937-0.940 at 8-13° C.

It should contain 1.23 per cent. of iodine, and about 0.27 per cent. of iron, both in a chemically combined condition. No iodine reaction must be observed when the mixture is shaken with diluted starch, not even if a solution of potassium iodide be used along

B

with the starch. The addition of potassium iodide, which dissolves any free iodine left in the oil, greatly enhances the delicacy of the reaction.

The author prepares this oil in large quantities (800 to 1000 litres) at a time, in an iron vessel provided with a stirring apparatus, and capable of being hermetically closed.

Analysis of Iodide of Iron Cod Liver Oil. Prof. E. A. van Der Burg. (*Pharm. Journ.*, 3rd series, xi., 189.) The author gives the following directions for assaying the preparation treated of in the preceding article:—

The quantity of iron may be found by burning at least 20 grams in a small porcelain or platinum cup, and weighing the ferric oxide that is in that way produced. This weight, multiplied by 0.7, gives the quantity of iron in the oil. If the oil is properly made it ought to contain 0.27 per cent. of iron. Great care is required in burning the oil, as it is very combustible, and the experiment consequently liable to fail.

To estimate the iodine 5 grams of the oil are sufficient. These should be saponified with an alcoholic solution of potash, by heating it for an hour or two in a porcelain dish on a water-bath. After this the soap must be completely charred in the same dish at a moderate heat, the char completely exhausted with water, the clear and colourless liquid acidulated with hydrochloric acid, and the iodine now determined by palladium. 5 grams of the oil ought to yield .087 gram of palladium iodide = .025 gram of metallic palladium.

Preparation of Pure Oleic Acid for Use in Pharmacy. E. C. Saunders. (*New Remedies*, 1881, 162.) The process recommended by the author differs from the usual one in the use of previously saponified oil, of a much smaller proportion of lead oxide, and a consequently smaller quantity of liquid to separate the margarate of lead; and finally, in the substitution of alcohol for ether.

The practical formula is as follows:—Cut up 5 pounds of white Castile soap, and put it into 20 pounds of boiling water over a fire. Add 10 ounces of sulphuric acid, and boil with constant stirring till two clear layers are formed. Decant the upper layer, shake with 5 pounds of hot water, and again decant the oily liquid. In it dissolve 4 ounces of lead oxide with a gentle heat, and while hot pour into it 5 pounds of alcohol of .820 sp.gr., previously heated to 150° F. Let it stand twenty-four hours, and filter, pressing the residue strongly. To the clear solution add 1 oz. of hydrochloric acid, and shake thoroughly. Then mix with 10 pounds of water, decant the

acid, again, wash with 10 pounds of water, and filter the oleic acid. The alcohol used is entirely separated from the acid by the water, and can be recovered by distillation. The product will be about $2\frac{1}{2}$ pounds of pure oleic acid, of a pale yellow colour, and almost inodorous, there being but a faint smell of olive oil. It is of sp. gr. .897, and answers all the tests, showing freedom from the solid fatty acid. Precipitated oxide of mercury is freely soluble in it without any decomposition. Continued exposure to the air lowers the freezing point, but the author does not find it to acquire the brown colour and rancid odour observed by Professor Miller.

By putting half a pound of freshly burned wood charcoal into the alcoholic liquid obtained, and allowing it to macerate twenty-four hours before distilling, the alcohol is recovered nearly odourless. With care the loss of alcohol is very slight. Benzin cannot be substituted for alcohol, as lead margarate is soluble in it to a considerable degree.

Mercurial Ointment. Prof. J. P. Remington. (*Amer. Journ. of Pharm.*, 1881, 192.) The author recommends the following as a rapid and convenient mode of preparing this ointment:—

| | |
|--------------------------------|-----------|
| Mercury | 50 parts. |
| Lard | 25 „ |
| Suet | 25 „ |
| Mercurial Ointment | 10 „ |
| Comp. Tinct. Benzoin | 4 „ |

Mix the mercury with the compound tincture of benzoin in a mortar, add the mercurial ointment, and triturate the mixture until the globules of mercury cease to be visible with a lens of 10 diameters power; then add the suet and lard, previously melted together and partially cooled, and mix all together until smooth. It is unnecessary to use old and rancid mercurial ointment, but the addition of some properly made mercurial ointment, which is entirely free from rancidity, facilitates the extinction of the mercury with the aid of the compound tincture of benzoin. The latter has a better effect than the simple tincture. The small amount of resinous matter, less than 1 per cent., introduced into the ointment, can have no injurious effect.

Oleate of Mercury. N. Rosenwasser. (*Druggists' Circular*, January, 1881.) The oleates of mercury prepared in the usual way are decomposed on exposure to the air, whether an excess of oleic acid be used or not. The author, therefore, recommends the following changes in the method of preparing and dispensing these oleates:—

1. The preparation of the true oleate of mercuric oxide.

This is done by combining mercuric oxide with its equivalent of oleic acid. The proportions are $\text{Hg O} = 216$, $2 \text{ C}_{18} \text{H}_{33} \text{O}_2 = 562$, or one part of mercuric oxide to $2\frac{1}{2}$ oleic acid by weight. Oleate of mercury thus prepared boils between 280 and 290° F., depositing mercurous oxide. It is solid, transparent while melted, opaque on cooling, and of the consistence of resin cerate in winter.

2. As the addition of cosmoline, vaseline, and allied petroleum bodies, prevents the oxidation of the oleate, the author proposes to bring the mercuric oleate to its requisite strength of 20 per cent., by the addition of these, thus keeping a constant, unaltered oleate of 20 per cent., which admits of still further dilution as may be desired. As a matter of cost, these diluents are as cheap again as the excess of oleic acid, which presents no advantage as a preservative or as a solvent.

3. Stillé, Maisch, and other authorities, direct the use of yellow oxide of mercury; but as the price of this is nearly six times that of the red oxide, the author tried to substitute the latter for the former, and found that, by the following process, the oleate could be prepared even more easily from the red than the yellow oxide:—The oleic acid is heated in a porcelain dish to about 220° F., the red precipitate then being added in small quantities, with constant stirring. The heat should be carefully regulated and not permitted to rise above 240° F. If the oxide of mercury is pure, it will entirely dissolve in pure oleic acid without sediment; otherwise it will be best to pour the solution while hot, from the slight impurities usually contained in red precipitate. As the acid is usually not entirely free from impurities, a slight allowance will be found necessary in practice to make up this deficiency.

The Borocitrates and their Preparation. E. Scheibe. (*Pharmaceutische Zeitschrift für Russland*, xix., 514, and *Pharm. Journ.*, 3rd series, xi., 389.)

MAGNESIUM BOROCITRATES.—Of all the compounds of borocitric acid, the most interesting is the salt of magnesium, since it was successfully used therapeutically more than forty years ago by Graeger, Becker, and other physicians in cases of kidney disease and stone. A subsequent treatise upon the action of magnesium borocitrate in calculous disorders attributed this to the boric acid, which does not undergo any change through the secretions in the human body and is therefore able to exercise a decomposing action upon the salts of uric and phosphoric acids.

After the administration of large doses of the magnesium salt,

the author found the urine to contain boric acid, in the free as well as in the combined state.

According to some experiments carried out by N. Schwartz, magnesium borocitrate appears to be a stronger antiseptic against bacteria than pure boric acid; and indeed he proved the acid salts to have a more energetic action than the neutral salt. The mono- and diborocitrates of magnesium appear to decompose in the presence of bacteria and ferments; and the author thinks that it may be assumed that in this case the energetic action depends upon the boric acid set free from the compound in the nascent state.

The acid salts have also the advantage that in comparison with the triborocitrates their taste is more agreeable and they are more soluble in water. For these reasons the author considers the mono- and diborocitrates to be preferable to the neutral salts for therapeutic use. Moreover, his analysis of the preparations most commonly met with in pharmacy and commerce show these to be acid salts.

Like the salts of the fixed alkalis and alkaline earths, there exist three chemically constant compounds of the magnesium borocitrates. By the solution in boiling water of the constituents according to the following proportions by weight, these salts can be easily obtained. As, with the exception of the potassium compound, the borocitrates crystallize badly, or mostly not at all, the preparations are produced in scales, or more suitably in the powder form.

The following are the proportions by weight given by the author:—

(a) *Magnesium Triborocitrate*, $(C_6 H_5 O_7)_2 Mg_3 + (B_3 H_3 O_6)_2$.—Crystallized boric acid, 35 parts; carbonate of magnesia, 25 parts, or calcined magnesia, 12 parts; crystallized citric acid, 42 parts.

(b) *Magnesium Diborocitrate*, $(C_6 H_6 O_7)_2 Mg_3 + (B_3 H_2 O_4)_2$.—Crystallized boric acid, 24 parts; carbonate of magnesia, 16 parts, or calcined magnesia, 8 parts; crystallized citric acid, 42 parts.

(c) *Magnesium Monoborocitrate*, $(C_7 H_7 O_2)_2 Mg + (B H O_2)_2$.—Crystallized boric acid, 24 parts; carbonate of magnesia, 16 parts, or calcined magnesia, 8 parts; crystallized citric acid, 80 parts.

LITHIUM BOROCITRATES.—All three lithium compounds are easily soluble in water, and what was stated respecting the preparation of the magnesium salts applies equally to them. As a starting point of the preparation, carbonate of lithium is the most suitable.

(a) *Lithium Triborocitrate*, $(C_6 H_5 Li_3 O_7 + B_3 H_3 O_6)$.—Crystallized citric acid, 20 parts; lithium carbonate, 11 parts; crystallized boric acid, 18 parts.

(b) *Lithium Diborocitrate*, $(C_6H_4Li_2(BO)_3O_7) + 2H_2O$.—Crystallized citric acid, 20 parts; lithium carbonate, 7 parts; crystallized boric acid, 12 parts.

(c) *Lithium Monoborocitrate*, $(C_6H_6Li(BO)O_7) + H_2O$.—Crystallized citric acid, 20 parts; lithium carbonate, 4 parts; crystallized boric acid, 6 parts.

SODIUM BOROCITRATES.—The normal salt of sodium and both acid salts are obtained by decomposition of crystallized sodium carbonate.

(a) *Sodium Triborocitrate*, $(C_6H_5Na_3O_7 + B_3H_3O_6)$, etc.—Crystallized citric acid, 21 parts; crystallized sodium carbonate, 42 parts; crystallized boric acid, 18 parts.

(b) *Sodium Diborocitrate*.—Citric acid, 20 parts; sodium carbonate, 28 parts; boric acid, 12 parts.

(c) *Sodium Monoborocitrate*.—Citric acid, 20 parts; sodium carbonate, 14 parts; boric acid, 6 parts.

A sodium compound prepared by Schering, of Berlin, occurs as a light powder, easily soluble in water, having an agreeable acid taste, and in its composition standing nearest to the monoborocitrate. An analysis gave the following percentage composition:—Citric acid, 80·15; sodium, 8·77; boric acid, 11·08.

AMMONIUM BOROCITRATES.—The ammonium salts are most suitably prepared from the ammonium carbonate. The compounds must be carefully dried, since otherwise decomposition gradually takes place, ammonia being volatilized.

(a) *Ammonium Triborocitrate*, $(C_6H_5(NH_4)_3O_7 + B_3H_3O_6)$, etc.—Citric acid, 20 parts; ammonium carbonate, 15 parts; boric acid, 18 parts.

(b) *Ammonium Diborocitrate*.—Citric acid, 20 parts; ammonium carbonate, 10 parts; boric acid, 12 parts.

(c) *Ammonium Monoborocitrate*.—Citric acid, 20 parts; ammonium carbonate, 5 parts; boric acid, 6 parts.

A preparation made by Schrenk, in Darmstadt, has almost the same composition as the normal ammonium triborocitrate. It consists of citric acid, 51·38 per cent.; ammonium (NH_4) , 14 per cent.; boric acid, 34·62 per cent.

POTASSIUM BOROCITRATES.

(a) *Potassium Triborocitrate*, $(C_6H_5K_3O_7 + B_3H_3O_6)$, etc.—Citric acid, 20 parts; potassium bicarbonate, 30 parts, or monocarbonate, 20 parts; boric acid, 19 parts.

(b) *Potassium Diborocitrate*.—Citric acid, 20 parts; potassium bicarbonate, 20 parts, or mono-carbonate, 14 parts; boric acid, 12 parts.

(c) *Potassium Monoboro-citrate*.—Citric acid, 20 parts; potassium bicarbonate, 10 parts, or mono-carbonate, 7 parts; boric acid, 6 parts.

IRON BOROCITRATES.—Numerous experiments and analyses show that the salts of the heavy metals are wanting in the power to combine chemically citric and boric acids; permanent compounds of constant composition exist only in double compounds with the fixed alkalies. The iron preparation was made by dissolving freshly precipitated oxyhydrate of iron in the acid borocitrates. The amount of iron oxide taken up amounted in the diborocitrate of sodium and iron oxide to almost 8 per cent., and in the monoborocitrate to over 16 per cent.

Decomposition of Cinnamon Water. J. B. Enz. (*Archiv der Pharm.*, Oct., 1880, 287.) The author observed the separation of crystals of cinnamic acid from a sample of cinnamon water distilled from Chinese cinnamon. With the object of obtaining more of the acid, he added to this water 10 drops of oil of cinnamon and the same quantity of glycerin. But instead of cinnamic acid, there appeared upon the surface of the water colourless, very refractive drops of a benzol-like odour. It seems, therefore, that under certain conditions the cinnamic acid of cinnamon water may be decomposed in the same manner as by distillation with excess of lime into cinnamene and benzol. Whether this decomposition is due to the presence of protein compounds mechanically carried over in distillation, or to other causes, has not been ascertained.

The Bottling of Aërated Waters. Dr. W. J. Clark. (*Chemist and Druggist*, October, 1880, 436.) This subject is dealt with in a long article, concluding with the following *résumé* :—

With regard to the gas, or carbonic acid, it must be free from air, and all the loopholes at which air could enter must be jealously guarded. The result of air in the cylinder is to give a fictitious pressure and badly-charged water. This affects the bottle by not giving off sufficient carbonic acid gas in sniffing to blow out the air, with the production of a fictitious pressure in the bottle and an inferior water.

The pressure at which to bottle must not be fixed by any one, for it is for each maker to see with the appliances and skill at his disposal what is the lowest cylinder pressure necessary to produce in his bottles a pressure of 45 to 50 lbs., the air at the same time not exceeding 28 c.c., or about 1 oz. This is said because one bottler will require 150 lbs., another only 100 lbs., while by special appliances one can produce the same with 75 lbs.

It is necessary to limit the amount of air, for the reasons given before.

From the consumer's point of view, it is not sufficient to see if the corks blow out well, nor whether the liquid foams over the mouth. These may be the result of air present. The great test must eventually be the palate, for consumers cannot analyse the waters they drink; but in so testing, it is necessary not to blame a water for being badly prepared when the fault may lie in leakage through the cork being left upwards, or perchance in the temperature of the water having risen owing to the heat of the room, or in the presence of cork-dust in the tumbler, or in excessive shaking, all of which tend to render the water flat and insipid. The appearance of a long-continued froth on the surface is also no criterion, for it may be caused by the use of some foam-producer, and these, from the author's experience, have but little, if any, effect in retaining carbonic acid.

NOTES AND FORMULÆ.

PART III.

NOTES AND FORMULÆ.

Artificial Carlsbad Salt. The following formula is proposed by the German Apothecaries' Society for insertion in the new edition of the Pharmacopœia :—

| | | |
|------------------------------------|---|------------|
| Chloride of Sodium, pure, powdered | . | 115 parts. |
| Sulphate of Potassium | " | 125 " |
| Dry Sulphate of Sodium | " | 200 " |
| Bicarbonate of Sodium | " | 205 " |

Mix.

A white, dry powder. A solution of 6 grams of the above mixture in a litre of distilled water yields a solution corresponding to the natural Carlsbad water.

Comparative Value of Sulphate of Quinine and Sulphate of Cinchonidine. Dr. Bourru. (*New York Med. Journ.*, from *Bull. Gén. de Thérap.*) The author has made careful clinical researches with reference to the extent to which the sulphate of cinchonidine may be substituted for the much more expensive sulphate of quinine in the treatment of malarial affections. He calls attention to the fact that, to act effectively, it should be given from five to seven hours before the time for the occurrence of the paroxysm; departure from this rule seems to interfere with the action of cinchonine more than with that of quinine, perhaps because the action of the former is less intense or less durable. The administration of cinchonidine is not followed by vertigo, tinnitus aurium, disturbances of vision, or any other inconvenient symptoms induced by quinine. A study of twenty-nine cases of malarial intermittent fever treated by the author with sulphate of cinchonidine, the dose varying from 8 decigrams (gr. xij.) to 1 gram, gives the following results:—Twenty-four out of the twenty-nine cases were completely cured. Three cases were not cured, but these resisted quinine also. Two of the cases of malarial intermittent fever were complicated with hepatic disturbances, and in these two the treatment was successful. The

successful cases included eight which had previously been treated with quinine without yielding.

Deodorizing Effect of Quinine upon Musk. (From *Répertoire de Pharm.*) A mixture of musk with rather more than three times its weight of sulphate of quinine gradually loses its odour. In pills made of such a mixture, with the addition of liquorice powder and mucilage of acacia, the odour of the musk is masked to such an extent that it is possible distinctly to discern the odour of the liquorice.

Glycerole of Cinchona. F. Loos. (*Amer. Journ. of Pharm.*, October, 1880.) Glyceroles of calisaya or red bark are recommended by the author in preference to the liquid extract and tinctures, as they are not liable to form any deposit on keeping, and represent more fully the virtues of the bark employed.

As the process for making the glycerole of either *Cinchona succirubra* or *Cinchona calisaya* is exactly the same, one formula will suffice :—

| | |
|--|-----------------|
| R. Cinchona Bark in moderately fine | |
| powder | 16 ounces. |
| Glycerin | 12 " |
| Alcohol | 3 fluid ounces. |

Mix the liquids, and macerate the cinchona for five days, then pack in a conical glass percolator and displace with a menstruum composed of two parts of alcohol and one of water. Collect first twelve ounces and set aside, then continue the percolation to exhaustion. Distil off the alcohol, or evaporate, until reduced to $4\frac{1}{2}$ ounces, and when cold mix with the first 12 ounces; allow to stand a few days and filter.

Each fluid ounce represents an ounce of the bark. Dose, one teaspoonful.

Aromatic Glycerole of Cinchona.—If it be desired to mask the intensely bitter taste of the above preparation, the author recommends an aromatic glycerole of cinchona, made by mixing equal volumes of glycerole of cinchona and aromatic glycerole of liquorice. The latter is made as follows :—

| | | |
|--|--|------------------------|
| R. Liquorice Root, in fine powder | | 2 ounces. |
| Cinnamon, in fine powder | | 1 ounce. |
| Cloves, Anise, and Carraway, in fine | | |
| powder, each | | 2 drachms. |
| Glycerin | | 4 ounces. |
| Dilute Alcohol | | a sufficient quantity. |

Mix the drugs, and having moistened them with glycerin and a sufficient quantity of diluted alcohol, pack in a conical percolator and displace with dilute alcohol; set aside the first three ounces, and continue the percolation until exhausted. Evaporate until reduced to one fluid ounce, and when cold mix with first percolate, and filter.

Any of the above-mentioned glyceroles can be reduced to any desired strength by diluting with a menstruum composed of two parts of alcohol and one of water. Should the reduced preparation show any inclination to precipitate, it is advisable to add a small portion of glycerin to the menstruum used in making the dilution.

Dr. de Vrij's Improved Method for Preparing Liquid Extract of Cinchona. (*Pharmaceut. Zeitung.*, 1880, 187.) 100 grams of powdered East Indian red bark of good quality, are mixed with 38 grams of dilute hydrochloric acid of normal strength, and 362 grams of water, and macerated for twelve hours, at the expiration of which 20 grams of glycerin are added, and the whole mixture is transferred to a percolator. When the clear percolate ceases to come off, water is passed through the percolator until the percolate is no longer rendered cloudy by solution of soda, which is usually the case before 800 grams of percolate are obtained. The latter is then evaporated to 100 grams, and corresponds in strength to its own weight of bark.

Digestive Wine. Prof. Schmitt. (*L'Union Pharm.*, Nov., 1880. From *Chem. and Drugg.*) The author offers to supply a formula for a digestive wine, equal, if not superior, to the most approved products. For this purpose he recommends pharmacists to make their own pepsin. He advises that the rennet solution, after the preliminary treatment of the Codex, should be treated with a mixture of sulphate and phosphate of soda instead of hydrosulphuric acid, as those salts, in excess even, are rather likely to be of advantage than otherwise. This solution should be evaporated, at a very moderate temperature, to the consistence of a firm extract, and incorporated with 10 per cent. of the purest glycerin. The preparation thus obtained is called by the author *Pepsin extractive*.

Next he takes malt and crushes it in a linseed mill or in a marble mortar, macerates it for twenty-four hours with ten times its weight of cold water, and afterwards presses through linen. Strong alcohol is to be added to the liquid until 45° is marked on the centesimal alcoholometer. The liquid becomes turbid, and yields a considerable precipitate. After standing for twenty-four hours the liquid is filtered, and alcohol is added until 66° is marked. After standing another twenty-four hours the liquid is to be care-

fully decanted, and may be distilled for the recovery of the alcohol. The deposited precipitate is to be dried at a very moderate temperature till of a firm consistence, after which ten per cent. of glycerin are to be incorporated with it. The resulting product is called *Maltine extractive*.

For the preparation of wine of pepsin and diastase, take—

| | Grams. |
|------------------------------|--------|
| Pepsine Extractive | 5.50 |
| Maltine Extractive | 5.50 |
| Common Salt | 5.00 |
| Good Brandy | 45.00 |
| Old Chablis Wine | 400.00 |
| Grenache Wine | 500.00 |

Each tablespoonful of this wine would contain about twenty centigrams of digestive ferments.

Vinum Picis Liquidæ. (*Zeitschr. des oesterr. Apoth. Ver.*, 1880, 553.) Six ounces of wood tar are mixed with two ounces of carbonate of magnesia, and digested with four pints of sherry wine for an hour; the mixture is then filtered, and the filtrate made up to four pints with sherry. The tar, previous to its use, should be purified by shaking it several times with water, in order to remove free acids and substances imparting an unpleasant taste to the water. In the above formula any free acid will be neutralized by the magnesia. But as the latter is used in excess and is not wholly insoluble, the product is slightly alkaline, and is therefore liable to cause precipitates if this wine be mixed with solutions of salts of alkaloids.

Elixir Chloroformi Compositus. Dr. W. F. McNutt. (*Pharm. and Chem.*, 1880, 468.) This preparation, made according to the following formula, is recommended by the author as a substitute for chlorodyne:—

| | |
|----------------------------------|-----------|
| ℞ Morphine Hydrochlorat. | gr. ss. |
| Chloral. Hydrat., | |
| Chloroform | āā 3 ss. |
| Tinct. Cannab. Ind., | |
| Tinct. Capsici, | |
| Acid. Hydrocyanic del. | āā ʒ. xx. |
| Spirit. Menth. Pep. | ʒ. x. |
| Syrup. Sassafras. co. | ad. ʒj. |
| Dose: one drachm. | |

The author's objections to chlorodyne are, that it is not a perfect mixture, as it separates too rapidly; that it is too concentrated to

be safe for general use; that it is too expensive; and finally, that it is a patent medicine, the exact formula of which is unknown. The elixir here recommended is free from these objections, and is said to be equal to chlorodyne as a medicinal agent in all respects.

Elixir of Glycyrrhizin. R. F. Fairthorne. (*Amer. Journ. of Pharm.*, 1881, 244.) This will be found unusually effectual in disguising the bitter taste of quinine, and is prepared by the following formula. A tincture of liquorice is made first, from which the sweet principle is obtained thus:—

| | |
|---|----------------------|
| ℞ Liquorice Root, in moderately fine powder | ℥viii. |
| Liquor Ammonia | fl 3j. |
| Glycerin | fl 3j. |
| Dilute Alcohol | sufficient quantity. |

Mix the glycerin, solution of ammonia, and half a pint of diluted alcohol. With two fluid ounces of this mixture moisten the liquorice root; pack in a percolator, and pour on the remainder. Displace with dilute alcohol until eight fluid ounces of tincture are obtained. In order to obtain the glycyrrhizin, add nitric acid to it in small portions at a time as long as any precipitate occurs; set aside in a cool place (an ice chest for instance) for five or six hours. Pour off the supernatant clear fluid, which may be thrown away, and place the remainder on a paper filter. After the liquid portion has been thoroughly drained, carefully scrape off the solid, which is impure glycyrrhizin. This is placed in a mortar, and dissolved in two fluid ounces of water by means of solution of ammonia, which is to be added very carefully, so as not to have any excess. Filter the solution, and add it to the following mixture; namely,—

| | |
|---|---------------|
| Glycerin | 2 fl. ounces. |
| Syrup | 3 " |
| Curaçao Cordial | 4 " |
| Water, sufficient to make the elixir measure | 12 " |

and filter.

Ammoniaccal Glycyrrhizin. M. Connerade. (*New Remedies*, 1881, 81.) This substance has been previously mentioned as an excellent vehicle for disguising the taste of quinine, etc (see *Year-Book of Pharmacy*, 1876, 93). The author recommends the following directions for its preparation:—

Macerate ground liquorice root with one and a half parts by weight of water, strain, wash the residue with a very small quantity of

water, heat the mixed liquids to boiling to coagulate albumen, strain again, and then add diluted sulphuric acid (1 in 10) as long as a precipitate is produced. Let this settle, decant the liquid, and dissolve the precipitate in solution of ammonia, diluted with nine parts of water. Filter the latter, and evaporate it to dryness. The compound then remains as a brown, friable varnish, unaltered by air, of a pure, sweet taste, easily soluble in cold water, and imparting to the latter, even when diluted to 1 in 1,000 parts, an amber colour. The yield is about 10 per cent. of the weight of the root.

Disguising the Taste of Castor Oil. (*Chem. and Drugg.*, Dec., 1880, 517.) The *Boston Medical and Surgical Journal* says that castor oil may be made so palatable that a patient will not recognise it, if it is made into an emulsion containing castor oil, 3j.; tinct. cardamom. comp., 3iv.; ol. gaultheriæ, gtt. iv.; pulv. acaciæ et pulv. sacchari alb., aa 3ij.; aq. cinnamomi, q.s. 3iv. *Misce secundum artem.*

A Mode of Disguising the Taste of Cod Liver Oil. Dr. Penteves. (*New Remedies*, Dec., 1880. From *La France Médicale*.) In order to render cod liver oil tasteless, the author recommends to mix a tablespoonful of it intimately with the yolk of an egg, add a few drops of essence of peppermint, and half a tumbler of sugared water, so as to obtain *lait du poule*. By this means the taste and characteristic odour of the oil are entirely covered, and the patients take it without the slightest repugnance. Besides, the perfectly emulsified condition of the oil renders it much more easy of absorption.

Oil of Fennel as a Means of Masking the Odour of Iodoform. M. Biermann. (*Zeitschr. des oesterr. Apoth. Ver.*, 1880, 399.) Oil of fennel is recommended by the author as an efficient means of masking the odour of iodoform, and also that of musk. Five to eight drops of the oil are to be added for each gram of iodoform.

Petersen (*Pharmaceut. Zeitung*, April 27, 1881, 254) recommends oil of peppermint for the same purpose.

Cod Liver Oil with Iodoform. (*Pharm. Zeitschr. für Russland*, 1880, 562.) Fonssagrives recommends the following formula:—

| | | | | | | |
|---------------|---|---|---|---|---|------------|
| Cod Liver Oil | . | . | . | . | . | 100 grams. |
| Iodoform | . | . | . | . | . | 0·25 „ |
| Oil of Anise | . | . | . | . | . | 10 drops. |

The oil of anise somewhat masks the odour and taste of the cod liver oil.

Dose: a tablespoonful two or three times daily.

Fumigating Powder for Asthma (Anti-Asthmatic Powder).
(*Med. and Surg. Report.*)

℞ Potassii Nitratis,
Pul. Anisi āā ʒss.
Pulv. Stramon. fol. ʒj.
Mix.

A thimbleful of the powder, placed on a plate, is pinched into a conical shape and lighted on the top. It is then held near the patient, who inhales the fumes.

Ergot as a Remedy for Asthma. Dr. H. M. C. Clanahan. (*Medical News.*) The author has administered this drug in asthma, and reports several cases cured by half-drachm doses given three times daily for some weeks. No disturbance of digestion is reported.

Quillaia Tooth Wash. A. E. Bennett. (*Amer. Journ. of Pharm.*, Oct., 1880.) An excellent tooth wash, containing glycerin, is made as follows:—

℞ Soap Bark, ground 4 ounces.
Glycerin 3 „
Diluted Alcohol sufficient for 2 pints.
Oil of Gaultheria,
Oil of Peppermint āā 20 drops.

Macerate the soap bark in the mixture of glycerin and diluted alcohol for three or four days, and filter through a little magnesia previously triturated with the volatile oils.

Thus made, a better preparation is obtained than by macerating the bark in the dilute alcohol, and adding the glycerin afterwards.

Mialhe's Tooth Powder and Dentifrice. (*New Remedies*, Jan., 1881.) The formulæ for these are the following:—

Sugar of milk, 1,000 parts; lake, 10 parts; pure tannin, 15 parts; oil of mint, oil of anise-seed, and oil of orange-flowers, so much as to impart an agreeable flavour to the composition.

Mialhe's directions for the preparation of this tooth powder are to rub well the lake with the tannin, and gradually to add the sugar of milk, previously powdered and sifted; and lastly, the essential oils are to be carefully mixed with the powdered substances. Experience has convinced him of the efficacy of this tooth powder, the habitual employment of which will suffice to preserve the gums and teeth in a healthy state. This formula of Mialhe has been recommended, especially when the teeth have been blackened by chalybeates. It would, however, be useful in other cases.

For those who are troubled with excessive relaxation and sponginess of the gums, he recommends the following astringent preparation :—

Mialhe's Dentifrice.—Alcohol, 1,000 parts; kino, 100 parts; rhatany root, 100 parts; tincture of tolu, 2 parts; tincture of benzoin, 2 parts; oil of cannella, 2 parts; oil of peppermint, 2 parts; oil of anise-seed, 1 part.

The kino and the rhatany are to be macerated in the alcohol for seven or eight days, and, after filtration, the other articles are to be added.

A teaspoonful of this preparation, mixed in half a goblet of water, should be used to rinse the mouth after the use of the tooth-powder.

Spiritus Coloniensis (Eau-de-Cologne). The two formulæ here given are selected by the German Apothecaries' Society :—

1. *Schneider's Formula.*

| | |
|-------------------------------|---------------|
| Oil of Bergamot | 90.0 grams. |
| „ Lemon | 30.0 „ |
| „ Lavender | 15.0 „ |
| „ Clove | 40 gutt. |
| „ Rosemary | 48 „ |
| „ Thyme | 24 „ |
| „ Cinnamon | 40 „ |
| Musk | 0.06 gram. |
| Alcohol | 3780.0 grams. |
| Rose Water | 180.0 „ |
| Orange-flower Water | 180.0 „ |

The oils are dissolved in the alcohol, the musk added, and the mixture allowed to macerate for eight days. Then the rose and orange-flower water are added, and after the lapse of another eight days the mixture is distilled from the water-bath until 4,000 grams of product are obtained.

2. *Wilm's Formula.*

| | |
|-------------------------|----------|
| Oil of Neroli | 4 parts. |
| „ Lavender | 4 „ |
| „ Rosemary | 8 „ |
| „ Lemon | 8 „ |
| „ Bergamot | 15 „ |
| Alcohol | 1000 „ |

Macerate a few days, and filter.

Lip Salve. (*Canadian Pharm. Journ.* From *Pharm. Zeitschr. für Russland*, No. 23.) The following formula is recommended by

Mr. Bienert, of Orechow, Russia. He states that the use of yellow instead of white wax prevents rancidity for nearly a year, and that the addition of salicylic acid insures its keeping in quantities for a much longer period :—

| | |
|------------------------------------|-----------|
| Spermaceti | 18 parts. |
| Yellow Wax | 100 " |
| Oil of Almond (or Olive) | 150 " |
| Alkanet | 12 " |
| Oil of Bergamot | 2 " |
| „ Lemon | 2 " |
| Pomade Jasmine | 4 " |
| Salicylic Acid | 3 " |

Instead of alkanet root, $\frac{1}{4}$ to 1 part of alkanin may be used.

Cachous. (*Canadian Pharm. Journ.*, June, 1881.)

| | |
|--|------------|
| Take Extract of Liquorice Root | 100 parts. |
| Dissolve in Warm Water | 100 " |
| Add Powdered Catechu | 30 " |
| Gum Arabic | 15 " |

Evaporate in a warm bath to an extract, adding—

| | |
|------------------------------|----------|
| Cascarilla Bark | 2 parts. |
| Vegetable Charcoal | 2 " |
| Orris Root | 2 " |
| Mastic | 2 " |

And when nearly cold, add—

| | |
|---------------------------------|-----------|
| Peppermint Oil. | 2 parts. |
| Tincture of Ambergris | 10 drops. |
| Tincture of Musk | 10 " |

Cut the mass into pieces of a suitable size and shape. These will, of course, be black or dark coloured. It has recently been noticed that thymol has a powerful deodorizing effect on tobacco smoke.

Cochineal Colouring. E. Rother. (*Pharm. and Chem.*, June, 1880.) Take of—

| | |
|---|-----------------------------|
| Cochineal (whole) | 8 troy ounces. |
| Alum, in fine powder | 2 " " |
| Citric Acid | 1 " " |
| Hydrochloric Acid | 1 fluid " |
| Ammonia Water, 16 to 18 per cent. | 2½ " " |
| Alcohol | 4 " " |
| Sodium Carbonate | } of each a sufficiency. |
| Sodium Chloride | |
| Water | |

Mix the hydrochloric acid and two troy ounces of sodium chloride with forty-four fluid ounces of water, and pour the solution upon the cochineal contained in a suitable vessel. After macerating for two days, with occasional stirring, decant the liquid and set it aside. On the residue pour thirty-two fluid ounces of water, and after a two days' maceration, as before, again decant the liquid and unite it with the previous liquor. The residue is now again mixed with thirty-two fluid ounces of water containing eight troy ounces of sodium chloride in solution, and after having macerated for two days, the mixture is poured into a strainer and subjected to strong pressure. The colate is now incorporated with the mixture of the first two macerates, and the resulting liquid, after a sufficient rest, decanted from the sediment. Dissolve the alum in the clear liquid, and add the ammonia water; pour the mixture upon a plain filter, and then wash the collected precipitate with water until practically freed from saline solution. Dissolve the citric acid in four fluid ounces of water, and add sodium carbonate in large crystals until the effervescence ceases. In this solution now dissolve the washed aluminium carminate with a gentle heat, add water to the measure of twenty-eight fluid ounces, then the alcohol, and mix.

The product of the new formula admits of greater concentration than any made by other processes. The proportion above adopted is one troy ounce of cochineal in four fluid ounces. A solution double this strength is first obtained after solution of the precipitate. The dry compound may also be prepared by precipitating the concentrated solution with alcohol or spreading it on glass plates, thereby obtaining it either as a pinkish powder or in dark red scales.

Improvement in the Preparation of Carmine. M. Hess. (*Zeitschr. des oesterr. Apoth. Ver.*, 1881, 46.) The improvement suggested consists in the removal of the fat from the cochineal by means of alcohol as a preparatory step, before extracting the carmine. The product in this case is said to possess a much purer and finer colour than carmine extracted from cochineal without the previous removal of fat. The author found 17 per cent. of hard fatty matter in Guatemala, 7 per cent. in Java, and 58 per cent. in Canarian cochineal.

Colouring for Tooth Powder. R. F. Fairthorne. (*Chem. and Drugg.*, April, 1881, from *Amer. Journ. of Pharm.*) The author recommends to dissolve 1 oz. best carmine in 6 ozs. liq. ammon. fort., and add the solution to sufficient precipitated chalk to absorb it, triturating with more chalk until a powder is obtained. This is allowed to dry and free itself from ammonia. It is then sufficient

to colour 13 lbs. of tooth powder. By this method 1 oz. of carmine is said to go as far as 1½ ozs. used as a powder.

Glycerin as a Remedy for Acidity. Drs. Ringer and Murrell. (*Lancet*, July 3, 1880, 6.) The authors relate a case of long standing acidity which was completely cured by the administration of glycerin. They quote a statement of J. Mekulics (*Archiv für klin. Chir.*, xxii. [2], 1878), that glycerin, although it destroys bacteria and prevents the formation of septic poison, dissolves and preserves the septic poison itself, and point out that glycerin does not hinder the digestive action of pepsin and hydrochloric acid; so that while it prevents the formation of wind and acidity, probably by checking fermentation, it in no way retards digestion. The use of 1 to 2 drachms of glycerin, either before, with, or immediately after food, is recommended, or it may replace sugar in tea or coffee. In some instances a cure does not occur till the lapse of ten or sixteen days. Mekulicos found that glycerin in the proportion of 2 per cent. prevented decomposition in nitrogenous fluids, such as diluted blood, for twenty-four hours, at ordinary temperatures; that 10 per cent. would prevent it for five days; and that 20 per cent. prevented it altogether, even at a higher temperature.

Glycerin Cement. (From *New Remedies*.) According to T. Morawski (see *Year-Book of Pharmacy*, 1880, p. 348), the hardest cement of this kind is produced by triturating 50 grams of litharge with 5 c.c. of glycerin. If more glycerin is used, the mass hardens much more slowly and imperfectly.

The small proportion of glycerin, however, makes it impracticable to prepare large quantities of the cement at a time. For this purpose it will be necessary to take more glycerin, in order to facilitate the trituration. But as it was also proved that the addition of a small quantity of water produced an equally durable cement, provided the proper proportions are observed, he found, after many trials, that the most favourable results are obtained by adding 2 volumes of water to 5 volumes of glycerin (sp. gr. 1.240); 6 c.c. of this liquid are incorporated with 50 grams of litharge. This mass requires a shorter time than any other proportions to produce a hard cement; ten minutes only being required to harden moderately, while after two hours it becomes even harder than any mixture containing litharge with glycerin alone. But after a few days the latter compound (prepared without water) overtakes the former in hardness, and remains so. If it is desired to produce a cement which rapidly hardens, and still has considerable firmness, it is advisable to use water with the glycerin.

This form of cement appears to be applicable for many purposes in the laboratory as well as in drug houses. It may be used as luting for joints, or as cement for stoppers, and also for mending stone, wedgewood, and porcelain ware. Of course, it should not be forgotten that it contains lead.

Tinctura Rusci (*Tinctura Olei Betulæ Empyreumatici*). G. and R. Fisk. (*Pharm. Journ.*, 3rd series, xi. 712.) This tincture is recommended for ringworm by Professor Kaposi, in Hebra's work on skin diseases. It is made as follows :—

| | | | |
|----------------------------------|----|----|-----------|
| R. Olei Rusci (Ol. Betulæ emp.). | . | . | 40 grams. |
| Alcoholis, | | | |
| Æth. Sulph. | āā | 4 | „ |
| Olei Lavand., | | | |
| „ Rutæ, | | | |
| „ Rosmarini | āā | 20 | gts. |

M. Sign. To be applied with a brush.

Oil of Eucalyptus as an Antiseptic. (*Pharm. Journ.*, 3rd series, xi., 250.) The oil of eucalyptus has lately been attracting some attention as an antiseptic dressing for wounds, and is claimed to possess not only the advantage over carbolic acid of being non-poisonous, but also of preventing the development of bacteria when it is present in the proportion of 1 in 666 of the dressing, whilst carbolic acid does not do so until the amount reaches 1 in 200. The eucalyptus oil is soluble in oil and pure paraffin, as well as in alcohol. For spray and irrigation, Professor Schulz recommends a mixture of the alcoholic solution with water. Dr. Siegen, according to a quotation in the *Lancet*, September 1880, p. 387, finds that a 5 per cent. solution of eucalyptus may be employed without any drawback. For gauze bandages he dissolves 3 parts of the oil in 15 of alcohol, and dilutes with 150 parts of water.

Disinfecting Power of the Chlorophenols. C. O. Cech. (*Journ. für pract. Chem.* [2], xxii., 345–347, and *Journ. Chem. Soc.*, 1881, 126.) It has often been noticed that the addition of bleaching powder to carbolic acid in dressing wounds causes healing to take place more rapidly than when the acid is used alone. It has been shown by Diamin that phenol and bleaching powder react on one another, forming mono-, di-, and tri-chlorophenol, which may be isolated and separated by treatment with a strong acid, and distillation with aqueous vapour. The author, considering that these chlorophenols are probably formed when carbolic acid and bleaching powder are used together in dressing a wound, and exert a healing power greater than that of carbolic acid alone, attempted to

prepare chlorophenols in quantity by the above process; it proved dangerous on the large scale, and direct treatment of phenol by chlorine gas was resorted to. A red crystalline mass was obtained, from which white crystals are obtainable by pressure between filter-paper; after purifying these crystals by precipitation from their alcoholic solution by water, they were dissolved in alcohol, and the bandages were impregnated with this solution. These crystals consist of a mixture of three chlorophenols, in which tri-chlorophenol predominates, and is probably the most useful. The chlorophenols present the advantage over phenols of being less corrosive and poisonous, and tri-chlorophenol probably has most advantage in these respects; its value as a disinfectant remains to be decided by the use of the chlorophenol bandages.

Chloralum. R. F. Fairthorne. (*Amer. Journ. of Pharm.*, 1881, 244.) This appears to be simply a solution of chloride of aluminum, of 1.244 sp. gr. Such a solution may be made by mixing alumina with about twice its bulk of water, and dissolving this base in strong muriatic acid, by the aid of heat, in a capsule, and continuing the evaporation until any excess of uncombined hydrochloric acid is driven off; when cool, dilute the solution with sufficient water to reduce the specific gravity to 1.244 at 60° F. Should any deposit occur before adding the water, the solution should be first filtered through cotton.

The Medicinal Use of Salicylates and Salicin. Prof. F. James. (*Brit. Med. Journ.*, March 19th, 1881.) In acute rheumatism, salicin seems likely to maintain its pre-eminence, because in this disease it is necessary to bring the patient rapidly under the influence of the remedy. This can only be accomplished by full doses at frequent intervals; and salicin seems to be more readily tolerated than salicylic acid or the salicylates. Very disagreeable, and sometimes even alarming, symptoms arise with these salts, as testified by Dr. Charteris and many others. Where, however, it is not necessary to saturate the system quickly with the drug, no such disagreeable effects will occur, and the salicylates of sodium and other bases deserve a more extensive trial. All produce similar effects, so far as the acid is concerned, each giving rise to variations due to its respective base.

The salicylates reviewed by the author from a therapeutic point of view are those of ammonium, potassium, sodium, lithium, calcium, quinine, and cinchonidine.

Dr. Charteris remarks that recent reports of delirium following the use of sodium salicylate have thrown some discredit upon the

use of the remedy. He traces this effect rather to the way in which it is produced than to anything in it *per se*. He claims that salicin has no tendency of the kind attributed to salicylate of sodium, and comes to the following conclusion respecting it:—

1. In uncomplicated rheumatism, salicin, in doses of twenty-five grains every three hours, dissolved in warm water or milk, will lower the temperature in two days.

2. When this has been accomplished, the frequency of the repetition of the dose should be diminished to every six hours; then, after two days, it should be stopped altogether, as its further continuance is useless and depressing.

3. If the temperature be not lowered in the time mentioned, the heart is very likely affected, and if such be the case the remedy is of no avail against the fever.

4. Before the employment of salicin, the urine should be tested for albumen; if this be present, the remedy should not be used.

5. He claims that delirium has never followed the use of salicin, the carbolic acid in the salicylic acid being probably the source of the delirium.

Salicylated Starch. Dr. Kersch. (*Wien. Med. Blätt.*, 1881, 1.) This preparation is made by incorporating pure starch, in small quantities at a time and with continual stirring, with a 3 per cent. solution of salicylic acid in alcohol. The latter must be used in such quantity that the starch, after settling, remains covered by a layer of the solution. After decanting the supernatant liquid, the deposited starch is pressed in a calico bag and dried at 80° C.

This preparation is recommended as an application in eczema. The affected parts are first deprived of scales, scurf, etc., with a 2 per cent. solution of carbolic acid and soft soap; then dried with absorbent antiseptic cotton, afterwards moistened with a 2 per cent. solution of salicylic acid in alcohol, and finally densely covered with the salicylated starch.

Mistura Quinæ Salicylatis. (From the *Lancet*.) A convenient method for the extempore preparation and administration of salicylate of quinine is the following:—

| | |
|--------------------------------|-----------|
| R. Acidi Salicylici | 3j. |
| Quinæ Bisulphatis | gr. x. |
| Syrupi | fl. 3j. |
| Liquoris Ammonię fort. | fl. 3j. |
| Aquę | fl. 3xvj. |

The bisulphate of quinine and the salicylic acid are shaken with 8 fl. ounces of water and allowed to stand for a short time, then the

ammonia is added under renewed agitation, finally the syrup and the rest of the water. Occasionally it is necessary to add a little more ammonia to produce a clear mixture.

Salicylates of Calcium and Bismuth in the Treatment of Cholera Infantum. (*Chemist and Druggist*, October, 1880.) These remedies were first suggested by Mr. Walter Kilner, M.B., in the St. Thomas' Hospital Reports. His theory is that the diarrhœa is an effort of nature to reduce the temperature of the body when this cannot be effected by the sweat glands. A paper is published in the Proceedings of the Medical Society of the County of Kings, New York, by Alexander Hutchings, M.D., who reports the employment of calcium salicylate in 27 cases, in all of which he was successful in controlling the disease. The patients ranged in age from two months to two and a half years. In no case was any modification of the previous diet called for, save in the matter of quantity. In all cases the dose was 3 to 5 grains every two to four hours. The total quantity consumed by each patient varied between six and eighteen powders. In a few cases minute doses of aconite and veratrum were given during the stay of the high temperature; and in other few, small doses of quinine were followed up after the subsidence of the disease. The calcium salicylate used was extemporaneously prepared, and was thus prescribed:—

| | |
|--------------------------|-----------|
| Acid Salicylic | gr. xxij. |
| Cretæ Præparat. | gr. viij. |
| Misce bene. | |

Divide in chart. No. vi. (gr. v.), vel No. x. (gr. iii.).
Sig. one every two to four hours. The powders are mixed in water, and taken after the effervescence has subsided.

Salicylic Acid as a Remedy for Perspiring and Sore Feet. (From *Chemist and Druggist*, Dec., 1880.) The following combination has been found to answer well in the German army:—

| | |
|---------------------------------|----------|
| Salicylic Acid | 3 parts. |
| Starch | 10 „ |
| Powdered French Chalk | 87 „ |

To be applied dry, daily, on the march, and every two or three days in garrison.

Salicylic Acid for Bee Stings. (From *Oil and Drug News*.) An Austrian paper recommends the following treatment:—First remove the sting as quickly as possible with a forceps or by scratching with a finger, but never with the thumb and forefinger, because

this squeezes more of the poison into the wound. Next squeeze the wound until a drop of blood comes out, and rub the place with an aqueous or dilute alcoholic solution of salicylic acid. The effect is increased by injecting the salicylic acid into the wound with the hypodermic syringe. After this the spot is painted with collodion, to keep out the air. A sting treated thus causes little or no pain, slight inflammation and swelling, and is not followed by nettle-fever or lameness in the most sensitive and nervous individuals.

Benzoate of Sodium as a Substitute for Sodium Salicylate. Dr. Wainwright. (*Brit. Med. Journ.*, 1881, 337.) The author has used sodium benzoate with considerable success in cases of acute rheumatism in the place of the salicylate. Given in doses of 15 to 20 grains every two or three hours, it arrests rheumatic fever with the same speed and certainty as the latter; and possesses the advantage of not giving rise to nausea, depression, and head symptoms, which so often follow the administration of salicylates. The use of the benzoate should be continued for a day or two after the rheumatic pains have ceased.

Preparation of Benzoate of Calcium. J. T. Skinn. (*Amer. Journ. of Pharm.*, April, 1881.) This salt has been used with success in the treatment of albuminuria during pregnancy. The following formula is recommended for its preparation:—

| | | |
|-------------------|---------|-------------------------------|
| Benzoic Acid | . . | 3iv. gr. xxxii (1952 grains). |
| Calcium Carbonate | . . | 3i. 3v. ʒi (800 grains). |
| Boiling Water | | Oiv. or q.s. |

Mix the acid and precipitated chalk thoroughly in a large mortar, and add water gradually to allow most of the carbonic acid gas to escape and prevent frothing over of the liquid. When the combination has taken place, or nearly so, the mass is transferred to a porcelain dish and dissolved in the remainder of the boiling water, with the exception of a slight excess of carbonate of calcium. Filter, while hot, into a shallow dish, when crystals will form on cooling. The mother-liquors may be evaporated twice more and yield more crystals, the whole product being about 3iv. 3v.

The salt is in feathery crystals, of a silky lustre, odourless, with but slight, rather alkaline taste, and is soluble in about twenty-four parts of water. It may be dispensed either in capsules or solution, a very good form of the latter being:—

| | | | |
|----|-----------------|---------|---------------|
| R. | Calci Benzoat. | | gr. cxxviiij. |
| | Aquæ Destillat. | | fʒvj. |
| | Syr. Aurantii. | | fʒij. |
| M. | Ft. mist. | | |

This makes a solution, by the aid of heat, containing 8 grains to half a fluid ounce, which is the usual dose.

Pilocarpine as a Remedy for Diphtheria and other Inflammatory Affections of the Tonsils, Pharynx, and Larynx. Dr. G. Guttman. (*Berlin Klin. Wochenschr.*, Oct. 4, 1880.) The author reports having obtained excellent results in the treatment of these complaints with pilocarpine administered in the following form:—

| | |
|------------------------------------|---------------------|
| Hydrochlorate of Pilocarpine . . . | gr. $\frac{1}{2}$. |
| Pepsin | gr. xxx. |
| Hydrochloric Acid | gtt. iij. |
| Distilled Water | ʒviij. |

A tablespoonful every hour, followed by a small dose of wine.

Six cases of diphtheria thus treated were cured in two to four days.

For children the following formula is recommended:—

| | |
|------------------------------------|---------------------|
| Hydrochlorate of Pilocarpine . . . | gr. $\frac{1}{2}$. |
| Pepsin | gr. xvj. |
| Hydrochloric Acid | gtt. ij. |
| Distilled Water | ʒviiij. |

Dose: A teaspoonful every hour.

Chloral Hydrate in Chronic Bronchitis. (*New Remedies*, 1881, 120.) A solution of 10 grains of chloral hydrate in one ounce of water is strongly recommended as a cure for chronic bronchitis in elderly persons. It is used as an inhalation through a steam atomizer morning and evening, and is said to afford immediate relief.

Syrup of Chloral and Tar. (*New Remedies*, 1881, 92.) The following combination is in some repute as a prompt remedy of obstinate cough, without necessitating the use of opiates, and producing great relief:—

| | |
|--|-----------|
| Chloral | 20 grams. |
| Alcohol | 40 " |
| Wood Tar | 8 " |
| Solution of Soda (sp. gr. 1.071) . . . | 8 " |
| Distilled Water | 25 " |
| Syrup | 1910 " |

Dissolve the chloral in the alcohol, and the tar in the water with the aid of the solution of soda. Mix the two solutions with the syrup, allow to stand for five hours, and filter. The resulting syrup is clear, of a dark red-brown colour, having the flavour of chloral and tar, and easily borne by delicate stomachs.

Liquor Arsenicalis Bromatus Clementis. (*Pharm. Zeitschr. für Russland*, 1880, 573.) This preparation is given in epilepsy in doses of one or two drops once or twice a day. It is made by dissolving 3.75 grams of arsenious acid in water with the aid of the same quantity of potassium carbonate, diluting the solution to the measure of 360 grams, then adding 7.5 grams of bromine, and setting the mixture aside till it is colourless.

Freezing Mixtures. A. Ditte. (*Comptes Rendus*, xc., 1163-1165, and 1263-1265.)

Sodium Sulphate and Hydrochloric Acid.—The reduction of temperature observed when sodium sulphate is mixed with hydrochloric acid is not due simply to the solution of the salt. Double decomposition takes place in accordance with the principle of maximum work; sodium chloride is produced, and this, being insoluble in concentrated hydrochloric acid, is precipitated; the water which existed in the salt as a solid is set free as a liquid, and it is mainly this passage of the water from the solid to the liquid condition which causes an absorption of heat. If the hydrochloric acid be not sufficiently concentrated, a portion of the salt formed is dissolved, the decomposition is not complete, and the maximum reduction of temperature is not obtained. When sixteen parts of sodium sulphate are mixed with twelve parts of the commercial acid, the temperature of the mixture is reduced about 33°. Similar effects are produced with mixtures of sodium phosphate or sulphate with nitric acid, and the alums or sodium phosphate with hydrochloric acid.

It follows, therefore, that the reduction of temperature which accompanies the mixing of certain crystallized salts with concentrated acids, is to be attributed to the liquefaction of the water which separates from the hydrated salt. Such being the case, it ought to be possible to prepare refrigerating mixtures by means of two solid substances, one of which is a strongly hydrated salt; it would be necessary to effect a double decomposition of such a nature that the heat produced was very small as compared with the number of heat units absorbed in the liquefaction of the water of crystallization.

Ammonium Nitrate and Sodium Sulphate.—Without reckoning the ten molecules of water in the sulphate which take no part in the decomposition, the heat-units before reaction will be $80.7 + (163.2 + 2.3) = 246.2$, and after reaction $157.2 + 88.9 = 246.1$: the double decomposition will therefore be effected without sensible variation of heat. But as the ten molecules of water set free will

require for liquefaction a large number of units, it is certain that the reaction will be accompanied by a very considerable reduction of temperature. A direct experiment showed that the temperature was lowered about 20° ; the solution of the new products in the water formed will also tend to reduce the temperature.

In like manner, a mixture of ammonium nitrate and crystallized sodium phosphate, reacting on the same principles, effects a reduction of about 18° , and ammonium nitrate or chloride with sodium carbonate about 25° . Ammonium nitrate and dry potassium carbonate also acts as a refrigerating mixture, but the cold produced in this instance is due to the dissociation of the ammonium carbonate (Berthelot).

The Testing of Wax and Honey. (*Journ. Chem. Soc.*, from *Dingl. polyt. Journ.*, ccxxxviii., 356.) Hager mentions that white wax contains 3–5 per cent. of tallow, and that manufacturers add turpentine or resin, in order to impart to wax the requisite tenacity. The sp. gr. of wax, when higher than 0.964, indicates the presence of stearin, resin, or Japan wax; and when lower than 0.956, paraffin, ozokerite, or tallow are present. Chloroform or fatty oils form a clear solution with dry wax, and a slightly turbid one with moist wax. By treating pure beeswax with a saturated solution of borax at 80° , the aqueous solution is rendered turbid; when Japan wax or stearin are present, a milky solution is obtained, remaining opaque after cooling. By boiling wax in a solution of soda (1 : 6), pure wax gives a translucent solution; if milky, stearin is present; if pasty or stiff, Japan wax has been added. When the sp. gr. is less than 0.956, and the wax behaves with borax and soda like pure wax, paraffin or ozokerit has been added; the same result is obtained when the sp. gr. is correct and the borax or soda test indicates the presence of Japan wax.

Ceresin (yellow or white) forms milky solutions in the borax or soda test, or behaves like beeswax, but has a lower sp. gr. With regard to the adulteration of honey with the artificially prepared product (adulterated with large quantities of starch-sugar), Planta-Reichenau proposes to estimate the amount of grape-sugar before and after inversion with a two per cent. solution of sulphuric acid. Pure bees' honey yields about 8 per cent. grape-sugar, whilst honey adulterated with starch shows as much as 45 per cent.; moreover, pure honey contains 63–71 per cent. of grape-sugar already formed; artificial honey only 29–37 per cent.

Tests for the Purity of Syrup of Raspberries. A. G. Vogeler. (From *Trans. Amer. Pharm. Assoc.*, 1880.)

1. Mix equal volumes of the syrup and solution of ammonia containing about 10 per cent. of the gas. The colour of true syrup changes to violet with a slight tinge of green. If, however, the colour changes instantly or soon to green or yellow, some foreign vegetable colouring matter is present; and if it should become colourless, or nearly so, it is adulterated with rosaniline.

2. If the syrup is coloured with red aniline, the latter may be detected by macerating in it some white silk or wool, and rinsing the cloth in water. Water removes the raspberry stain, but not the aniline. If the fabric be dipped in ammonia, the aniline dye will vanish, but reappear on moistening with acetic acid.

Liquor Violæ and Syrupus Violæ. C. Bernbeck. (*Pharmaceut. Centralhalle*, 1881, No. 13.) 100 grams of fresh violet flowers, free from the calices, are bruised in a stone mortar, and mixed with 50 grams of alcohol. The tincture is allowed to macerate for six or eight hours in a glass or porcelain vessel, and then pressed. The marc is then washed with distilled water to make up 100 grams, the liquid is then filtered, and poured into bottles tightly closed with corks covered with salicylated paraffin. The alcohol coagulates the vegetable albumen, and perfectly dissolves all the cyanin and violin of the flowers. This liquor, in the proportion of 1 to 9 of simple syrup, 1·36 sp. gr., yields a syrup of beautiful violet colour and odour.

Coating Pills. (*Amer. Journ. Pharm.*, Oct., 1880.) Make a solution of tolu in ether, nearly saturated (the residue from making syrup of tolu answers equally well, and is more economical); put the pills into a jar and moisten thoroughly with the solution; then throw them into French chalk contained in the pill-coater, and after rotating in the usual manner expose for a short time to allow the coating to dry; then coat twice in succession, as follows:—Mix equal parts of fresh mucilage of acacia and water, add two drops of this to each dozen pills, and throw them into French chalk, as before; finally, remove all the chalk from the coater, and polish the pills by rotating them for some time in the coater.

The object in first coating with the solution of tolu is to prevent the discoloration of the coating, which invariably follows if this is omitted.

Steatina. (*Berlin Klin. Wochenschr.*, 1881, No. 21. From *Amer. Journ. Pharm.*) Steatina are preparations of about the consistence of wax, and intended for external use in the place of ointments and plasters, in cases where the former are too soft and the latter too hard, for obtaining the full effects of the medicinal ingredients.

The old name *cerata* has been discarded, since many of the compounds do not contain wax.

Steatinum Belladonnæ.

| | |
|-----------------------------------|----------|
| ℞ Sevi Ovilli | 5 parts. |
| Adipis Suilli, | |
| Emplastri Plumbi Solidi | āā 2 „ |
| Extracti Belladonnæ | 1 „ |

Melt the first three articles together, and when congealing add the extract, previously triturated with a mixture of equal parts of water, alcohol, and glycerin, until of a syrupy consistence. Mix thoroughly.

In the same manner prepare *Steatinum conii*, *Steat. digitalis*, and *Steat. hyoscyami*.

Steatinum Chlorali Camphoratum.

| | |
|----------------------|-------------|
| ℞ Chlorali Hydratis, | |
| Camphoræ | āā 2 parts. |

Mix in a vial at a moderate heat until liquefied, then add

| | |
|-----------------------|----------|
| Ceræ Flavæ | 5 parts. |
| Sevi Ovilli | 11 „ |

previously melted together at a very moderate heat.

Steatinum Chlorali.

| | |
|--|----------|
| ℞ Chlorali Hydratis subtilissime pulveratæ | 2 parts. |
| Olei Olivæ | 5 „ |

Dissolve, and mix thoroughly with

| | |
|-----------------------|----------|
| Sevi Ovilli | 6 parts. |
| Ceræ Flavæ | 7 „ |

previously liquefied.

Steatinum Opiatum.

| | |
|---------------------------|-----------|
| ℞ Sevi Ovilli | 20 parts. |
| Olei Ricini | 5 „ |
| Styracis Liquidæ, | |
| Elemi | āā 3 „ |
| Bals. Peruviani | 2 „ |

Melt together, keep in a water-bath, and decant. To the purified mass, 25 parts, add—

| | |
|-------------------------------|-----------|
| Empl. Plumbi solidi | 15 parts. |
| Extracti Opii | 1 part. |

the latter previously dissolved in a mixture of 2 parts water, 1 part alcohol, and 1 part glycerin.

Steatinum Piceatum.

| | | |
|---|----------------------------------|-----------|
| ℞ | Picis Liquidæ | 12 parts. |
| | Sevi Ovilli Liquefacti | 100 „ |

Digest in a closed vessel for a day, and decant.

In like manner prepare Steat. cum oleo cadino and Steat. c. oleo rusci.

Steatinum Piceatum Fortius.

| | | |
|---|-------------------------|----------|
| ℞ | Picis Liquidæ | 1 part. |
| | Ceræ Flavæ | 1 „ |
| | Sevi Ovilli | 4 parts. |

Prepare like the preceding.

Steatinum Chloroformi.

| | | |
|---|----------------------|------------|
| ℞ | Chloroformi, | |
| | Oleo Olivæ | āā 1 part. |

Mix, and add to the following, previously melted together at a low temperature :

| | | |
|--|-----------------------|----------|
| | Sevi Ovilli | 1 part. |
| | Ceræ Flavæ | 2 parts. |

Steatinum Iodatum.

| | | |
|---|-------------------------------|----------|
| ℞ | Iodi subillime triti. | 1 part. |
| | Spir. Vini absoluti | 8 parts. |

Dissolve with the aid of heat, add

| | | |
|--|-----------------------|----------|
| | Olei Ricini | 7 parts. |
|--|-----------------------|----------|

and mix with the following, previously liquefied :

| | | |
|--|-----------------------|-------------|
| | Sevi Ovilli | |
| | Ceræ Flavæ | āā 7 parts. |

Steatinum Iodoformi.

| | | |
|---|----------------------------------|-----------|
| ℞ | Sevi Ovilli | 18 parts. |
| | Ol. Myristicæ expressi | 2 „ |
| | Iodoformi subt. pulv. | 1 part. |

Dissolve with the aid of a water-bath.

Steatinum Mercuriale.

| | | |
|---|----------------------------------|-----------|
| ℞ | Hydrargyri | 25 parts. |
| | Ungt. Hydrargyri (old) | 5 „ |

Triturate until globules of mercury are no longer visible, then mix with the nearly cold mixture of

| | | |
|--|-------------------------------|-----------|
| | Adipis Suilli | 22 parts. |
| | Sevi Ovilli | 10 „ |
| | Empl. Plumbi solidi | 18 „ |

Steatinum Sublimati.

| | | |
|----------------------------|-------|---------|
| ℞ Hydrarg. Chloridi corros | . . . | 1 part. |
| Alcoholis | . . . | 10 „ |

Dissolve, add

| | | |
|-------------|-------|-----------|
| Olei Ricini | . . . | 50 parts. |
|-------------|-------|-----------|

and mix with the nearly cold mixture of

| | | |
|-------------|-------|------------|
| Sevi Ovilli | . . . | 900 parts. |
| Ceræ Albæ | . . . | 50 „ |

Steatinum Thymolatum.

| | | |
|-------------|-------|---------|
| ℞ Thymoli . | . . . | 1 part. |
| Olei Olivæ | . . . | 5 „ |

Dissolve and mix with

| | | |
|-------------|-------|------------|
| Sevi Ovilli | . . . | 190 parts. |
| Ceræ Flavæ | . . . | 4 „ |

Steatinum Veratrini.

| | | |
|-------------|-------|-----------|
| ℞ Veratrini | . . . | 1 part. |
| Spiritus | . . . | 10 parts. |

Dissolve, add

| | | |
|-----------------------|-------|-----------|
| Olei Ricini | . . . | 15 parts. |
| Olei Menthæ Piperitæ, | | |
| Olei Lavandulæ | . . . | q. s. |

and mix well with

| | | |
|-------------|-------|-----------|
| Sevi Ovilli | . . . | 75 parts. |
| Ceræ Albæ | . . . | 10 „ |

Steatinum Zinci Benzoatum more Bellii.

| | | |
|------------------------|-------|----------|
| ℞ Zinci Oxidi | . . . | 1 part. |
| Adipis Benzoinati | . . . | 2 parts. |
| Sevi Ovilli Benzoinati | . . . | 4 parts. |

M. sec. art.

Large amounts of aqueous saline solutions cannot be permanently incorporated with cerates, and are apt to undergo decomposition with plasters. If incorporation of the dry salts be inadmissible, a mass of suitable consistence may be prepared from gelatin, glycerin, and water, and applied by saturating with it muslin or gauze. Substances rendering gelatin insoluble cannot be applied in this manner.

Hoof Ointment. (*Pharmaceut. Centralhalle*, xx., 453.) Very satisfactory results are said to have been obtained with the follow-

T

ing ointment in the treatment of all diseases peculiar to hoofs, such as cracks, scratches, cuts, etc. :—

℞ Benzoin,
Catechu,
Bone Charcoal each 10 parts.

Reduce to a very fine powder, and add :

Pure Carbolic Acid 8 parts.
Petroleum Ointment. 100 „
Yellow Wax 10 „

Mix, with a gentle heat.

Concentrated Tincture of Insect Powder. M. Finzelberg. (*Pharm. Centralhalle*, 1880, 118.) A tincture made from Persian insect powder in the proportion of one ounce to ten ounces of absolute alcohol is recommended by the author as an efficient protection against fleas, etc. It should be scattered over the bed or linen by means of a spray-producer.

Adulterated Insect Powder. Dr. C. Grote. (*Pharmaceut. Zeitung*, 1880, 108.) Attention is called by the author to the occasional presence of chrome yellow as an adulterant in Persian insect powder. It seems to be added not only for the purpose of imparting a brighter colour to the powder, but also with the intention of hiding the presence of other inert additions of a paler colour. The adulteration is easily detected by igniting a little of the powder with saltpetre, when a yellow mass is obtained, which, after treatment with water and filtering, yields a yellow solution, giving the reaction of chromic acid, while the lead may be detected in the insoluble residue.

Iodide of Ethyl as a Remedy for Asthma. Dr. D. R. Brower. (*New Remedies*, Sept., 1880.) The author finds that doses of about six drops of iodide of ethyl relieve some otherwise intractable cases of asthma. The only sensations traceable to the remedy are occasionally slight numbness of the extremities. Under its daily use the paroxysms become shorter, and the intervals longer.

Mistura Gentianæ et Ferri. Dr. J. F. Meigs. (*Amer. Journ. of Pharm.*, 1881, 244.)

℞ Ferri et Ammonii Citratis ʒi.
Extr. Gentianæ Fluid. fl. ʒss.
Spirit. Lavand. co. fl. ʒj.
Spirit. Vini rect. fl. ʒss.
Sacchar. Alb. ʒiiss.
Aqus. ad fl. ʒviij.

Tincture of Kino. J. B. Moore. (From *Druggists' Circular*.)

The following process is recommended by the author as superior to the official one, as the product is not apt to gelatinize :—

| | |
|-------------------------|------------------|
| Powdered Kino | .1½ troy ounces. |
| Alcohol | a sufficiency. |
| Glycerin | 4 fl. ounces. |
| Boiling Water | 8 " |
| Water | a sufficiency. |

Rub the kino in a mortar, adding the boiling water gradually, until a smooth and uniform mixture is obtained. To the mixture add four fluid ounces of alcohol. Mix well and strain through close muslin. Transfer the muslin strainer containing the residuum to a glass funnel, and wash with a mixture of one part of alcohol and two parts of water, until sufficient liquid has passed to make, with the strained liquid, twelve fluid ounces. To the product add the glycerin, and mix well. After standing a few days a sediment collects which may be separated by decanting with a siphon as much as possible of the clear fluid. The remainder may be strained through cotton or paper.

Emulsions of Tar. Dr. Girard. (*Med. Times*, from *Le Prog. Méd.*) Emulsions are considered by the author to be the best preparations of this substance for either external or internal use. Tar-water is too liable to alteration. Solutions made with the aid of alkalis are for some purposes rendered thereby objectionable, and by the process of maceration and concentration in a water-bath the volatile and bitter constituents are lost. With the aid of saponin, from soap-bark, M. Lebœuf is able to make an emulsion that is recommended by him as containing the active ingredients. In using the tincture of soap-bark for this purpose, not enough saponin can be taken to produce toxic effects. Such an emulsion is not difficult to take, and is comparatively easy of digestion.

Pyrogallic Acid as a Substitute for Chrysophanic Acid. (From *New Remedies*, 1881, 82.) Dr. Balmanno Squire, after an extended trial of pyrogallic acid as a substitute for chrysophanic acid in the treatment of diseases of the skin, finds that it falls considerably behind the latter in its value as a remedy, and is not, as Dr. Jarisch, of Vienna, has suggested, equivalent in its effect. Since chrysophanic acid was introduced, it has become so much lower in price that there is now no necessity for resorting to pyrogallic acid as a substitute. One case of poisoning following the epidermatic use of pyrogallic acid has already been reported—a matter for consideration when the merits of the two drugs are considered.

Dr. J. M. Finny confirms what Dr. Squire says respecting the superiority of chrysophanic over pyrogallic acid, and says that he has tried both at the same time on opposite sides of the patient's body, and that in such test cases the parts treated with chrysophanic acid recovered soonest.

Bacilla Cuneiformia Nasalia. Nasal Bougies. (*Pharmaceut. Zeitung*, xxv., 194. From *Pharm. Journ.*) Under these names are described a kind of bougies, used for introduction into the nose. They are from 8 to 10 centimetres long. The shape is cylindrical, but somewhat cone-shaped, having a diameter of about 3 to 4 millimetres at the point, and increasing towards the base to 6-8 millimetres. The following examples are given:—

Carbolized Nasal Bougies.

| | | |
|---|---------------------------|-------------|
| ℞ | Gelatinae Albæ | 55.0 grams. |
| | Glycerinae | 30.0 „ |
| | Aquæ Destillatæ | 20.0 „ |

Reduce to a gelatinous mass by heating in a closed vessel in a water-bath, and add—

| | |
|-------------------------------|------------|
| Acidi Carbolici puri. | 0.2 grams. |
|-------------------------------|------------|

Pour into glass moulds, or moulds made of paraffined paper, so as to make fifteen rods, 8 to 10 centimetres long and about 5 millimetres in diameter, and slightly cuneiform. For excessive or fetid discharge from the nose.

Tannin Nasal Bougies.

| | | |
|---|-------------------------|------------|
| ℞ | Acidi Tannici | 2.0 grams. |
| | Tragacanthæ | 6.5 „ |
| | Radici Althææ | 2.0 „ |

Mix, and add—

| | |
|---------------------------|-------|
| Glycerinae | 6.0 „ |
| Aquæ Destillatæ | 3.5 „ |

Make four cuneiform rods, 8 centimetres long. To be moistened before introduced into the nose.

Bacilla Cuneiformia Zincica.

| | | |
|---|---------------------------|-------------|
| ℞ | Gelatinae Albæ | 60.0 grams. |
| | Glycerinae | 40.0 „ |
| | Aquæ Destillatæ | 20.0 „ |
| | Zinci Sulfurici | 0.5 „ |

Mix, s. a., and make twenty cuneiform rods, 8 centimetres long.

Saxolinum. (*Amer. Journ. of Pharm.*, 1881, 34.) This is the name selected by a sub-committee of the Committee of Revision of the United States Pharmacopœia, to designate soft paraffins to be used in ointments, etc., similar to those preparations introduced as vaseline, cosmoline, petroline, etc. The word is derived from *saxum* rock, and *oleum* oil, and, though the article in question is not an oil, as this term is at present received in chemistry, the new word will probably be adopted by the Committee.

Otto of Roses. C. G. W. Lock. (From the *Journal of the Society of Arts*, Feb. 11, 1881.) Pure otto, carefully distilled, is at first colourless, but speedily becomes yellowish; its specific gravity is 0.87 at 72.5° Fahr.; its boiling point is 444° Fahr.; it solidifies at 51.8° to 60.8° Fahr., or still higher: it is soluble in absolute alcohol, and in acetic acid. The most usual and reliable tests of the quality of an otto are (1) its odour; (2) its congealing point; (3) its crystallization. The odour can be judged only after long experience. A good oil should congeal well in five minutes at a temperature of 54.5° Fahr.; fraudulent [additions lower the congealing point. The crystals of rose-stearoptene are light, feathery, shining plates, filling the whole liquid. Almost the only material used for artificially heightening the apparent proportion of stearoptene is said to be spermaceti, which is easily recognisable from its liability to settle down in a solid cake, and from its melting at 122° Fahr., whereas stearoptene fuses at 91.4° Fahr. Possibly paraffin wax would more easily escape detection.

The adulterations by means of other essential oils are much more difficult of discovery, and much more general; it is said that none of the Bulgarian otto is completely free from this kind of sophistication. The oils employed for the purpose are certain of the grass oils (*Andropogon* and *Cymbopogon* spp.), notably that afforded by *Andropogon Schœnanthus*, called *idris-yaghi* by the Turks, and commonly known to Europeans as "geranium oil," though quite distinct from true geranium oil. The addition is generally made by sprinkling it upon the rose leaves before distilling. The general characters of this oil are so similar to those of otto of roses—even the odour bearing a distant resemblance—that their discrimination when mixed is a matter of practical impossibility. The only safeguard against deception is to pay a fair price, and to import from firms of good repute.

Oil of Bergamot as a Remedy for Itch. (*Pharmaceut. Zeitung.*, 1881, 306.) According to a writer in the *Farmacista italiano*, oil of bergamot has proved a reliable and quick-acting remedy for scabies.

External Application of Oil of Peppermint. (*Zeitschr. des oesterr. Apoth. Ver.*, 1881, 76.) This oil, applied with a camel hair brush, is said to be an efficient remedy for burns.

A mixture of two parts of this oil with one part of glycerin is recommended as an application for chilblains.

Burns by Sulphuric Acid. M. Alanore. (From *Bull. de Thérapeutique*.) A soft paste made of calcined magnesia and water is strongly recommended for the treatment of sulphuric acid burns. The paste is spread thickly over the affected parts, and the application renewed after twenty-four hours. After recovery, the patients retain no marks of the accident.

Remedy for Whooping Cough. (*Pharmaceut. Zeitung*, 1880, 705.) The following mixture has been used with much success, and is stated never to fail in giving relief:—

| | |
|--|----------|
| Extr. Carnis, Liebig | 5 parts. |
| Aqua Laurocerasi | 1.5 „ |
| Vin Tokayens | 60 „ |
| $\frac{1}{2}$ to 1 teaspoonful every four hours. | |

Soluble Saccharate of Iron. C. Schneider. (*Pharm. Zeitschr. für Russland*, 1880, No. 17.) The author recommends the following process as yielding a very satisfactory preparation:—

In a capacious porcelain capsule mix 10 parts of (neutral) solution of chloride of iron (ferrie), of sp. gr. 1.480, with a solution of 4.5 parts of sugar, in an equal weight of cold water. Then add in 4 or 5 portions a solution of 12 parts of perfectly pure carbonate of sodium in 24 parts of water, and assist the escape of carbonic acid gas by brisk stirring with a glass rod. The resulting homogeneous magma dissolves at once, on the addition of 6 parts of solution of soda, of spec. gr. 1.330. The solution is now diluted with 83 parts of distilled water, stirred, and poured into a mixture of 83 parts each of alcohol and water. This produces a finely divided, quickly settling precipitate, which is easily washed with diluted alcohol (1:1), and finally with a little distilled water. It yields a light-brown syrup of a pure and agreeable taste.

The Composition of some Hair Dyes. J. F. Braga. (*Chem. News*, xli., 278-279.) Hair dyes are of two kinds, those to darken and those to lighten the hair. The latter, in all instances, were found to be hydrogen peroxide, sold under various fancy names. The former were preparations of lead, of which the thiosulphate is about the best. A successful imitation of one was made by the author as follows:—

| | |
|-------------------------------|------------|
| Lead Acetate | 5.7 grams. |
| Sodium Thiosulphate | 11.5 „ |
| Glycerin | 50.0 c.c. |
| Spirits of Wine | 100.0 c.c. |
| Distilled Water | 850.0 c.c. |

The lead acetate was poured into a mixture of the other constituents; it should be kept in the dark.

Another was :—

| | | |
|-------------------------------|------------|---------------|
| Lead Oxide | 17.0 grams | } to 1 litre. |
| Glycerin | 800.0 „ | |
| Precipitated Sulphur. | 17.0 „ | |

A third was :—

| | | |
|--------------------------------|------------|---------------|
| Lead Acetate | 12.5 grams | } to 1 litre. |
| Glycerin | 125.0 „ | |
| Precipitated Sulphur | 10.0 „ | |

The last mentioned was a very dilute solution of lead in potassium hydrate.

Wickersheimer's Preserving Liquid. (*New Remedies*, Oct., 1880. From *Archiv der Pharm.*) The composition of the original fluid has been gradually altered, so as to facilitate its manufacture, and to make it better applicable for various purposes. Messrs. Poetz & Flohr, of Berlin, prepare two kinds, one intended for injections, the other for macerating and immersing bodies, etc. Their composition is as follows :—

| | For Injecting. | For Immersing. |
|------------------------------|----------------------|----------------------|
| Arsenious Acid | 16 grams. | 12 grams. |
| Sodium Chloride | 80 „ | 60 „ |
| Potassium Sulphate | 200 „ | 150 „ |
| Nitrate | 25 „ | 18 „ |
| Carbonate | 20 „ | 15 „ |
| Water | 10 litres. | 10 litres. |
| Glycerin | 4 „ | 4 „ |
| Wood Naphtha | $\frac{1}{2}$ litre. | $\frac{1}{2}$ litre. |

Preservation of Lime Juice. (From *Zeitschr. des oesterr. Apoth. Ver.*) The following experiments were made with the object of testing the relative merits of different modes of preserving the juice :—

1. The fresh, unfermented juice was simply filtered through paper and then placed in a bottle and corked.

2. The fresh unfermented juice was placed in a tightly corked vessel, and heated to 100° C.

3. Some unfermented juice was mixed with 10 per cent. of alcohol (85°) and heated as in exp. 2.

4. The fermented juice was preserved in well corked bottles, without the addition of alcohol or heating.

5. The fermented juice was heated in closed vessel to 100° C.

6. The fermented juice was mixed with 10 per cent. of alcohol, and heated as in No. 5.

After the lapse of eight months, during a considerable portion of which the specimens were exposed to the sun and heat of summer, they were examined and all found in a perfect state of preservation. No decided superiority of any one of the processes named over the rest could be established.

Gilding Solutions. (*Chem. and Drugg.*, Dec., 1880, 517.) For cheaply gilding bronzes, gas-fittings, etc., the following mixture has been recommended:—2½ lbs. of cyanide of potassium, 5 ozs. of carbonate of potassium, and 2 ozs. of cyanate of potassium, the whole diluted in 5 pints of water containing in solution ¼ oz. of chloride of gold. The mixture must be used at boiling heat, and after it has been applied the gilt surface must be varnished over.

Mixture for Writing on Glass. F. L. Slocum. (*Amer. Journ. of Pharm.*, Dec. 1880.) This preparation, met with in the trade under the name of "Diamond Ink," was examined by the author, and found to be a mixture of 3 parts of barium sulphate, 1 part of ammonium fluoride, and a sufficient quantity of sulphuric acid to decompose the fluoride and to give to the mixture a semi-fluid consistence. It should be prepared in a leaden dish, and is best kept in a gutta-percha or leaden bottle. Any one making this mixture and wishing to keep it in a glass bottle, may do so by coating the inside of the bottle with paraffin, beeswax, or india-rubber.

In a subsequent number of the *American Journal of Pharmacy*, (February, 1881, p. 61), the author offers the following supplementary remarks on this subject:—

Liquid hydrofluoric acid etches glass, leaving a smooth surface; the fumes of the acid, however, act on glass, leaving a slightly rough surface.

Ammonium fluoride, dissolved in water, etches a still rougher surface on slight heating; but if this salt be mixed with an equal bulk of barium sulphate, moistened with water and gently heated, a very rough and opaque surface is produced.

Polygraph Composition and Ink. *New Remedies* publishes the following additional formulæ :—

1.

| | | | | | | |
|----------|---|---|---|---|---|------------|
| Gelatin | . | . | . | . | . | 100 parts. |
| Water | . | . | . | . | . | 375 " |
| Glycerin | . | . | . | . | . | 375 " |
| Kaolin | . | . | . | . | . | 50 " |

(*Lebaigue.*)

2.

| | | | | | | |
|--------------------|---|---|---|---|---|------------|
| Gelatin | . | . | . | . | . | 100 parts. |
| Dextrin | . | . | . | . | . | 100 " |
| Glycerin | . | . | . | . | . | 1000 " |
| Sulphate of Barium | . | . | . | . | . | q. s. |

(*W. Wartha.*)

3.

| | | | | | | |
|--|---|---|---|---|---|----------|
| Gelatin | . | . | . | . | . | 100 gm. |
| Glycerin | . | . | . | . | . | 1200 " |
| Moist Sulphate of Barium, washed by decantation | . | . | . | . | . | 500 c.c. |

(*W. Wartha.*)

4.

| | | | | | | |
|-------------------|---|---|---|---|---|----------|
| Gelatin | . | . | . | . | . | 1 part. |
| Glycerin (30° B.) | . | . | . | . | . | 4 parts. |
| Water | . | . | . | . | . | 2 " |

(*Kwaysser and Husak.*)

Polygraphic Inks.

1.

| | | | | | | |
|---------------------|---|---|---|---|---|-----------|
| " Violet de Paris " | . | . | . | . | . | 10 parts. |
| Water | . | . | . | . | . | 30 " |

(*Lebaigue.*)

2.

| | | | | | | |
|---------------------|---|---|---|---|---|----------|
| " Violet de Paris " | . | . | . | . | . | 1 part. |
| Water | . | . | . | . | . | 7 parts. |
| Alcohol | . | . | . | . | . | 1 part. |

(*Kwaysser and Husak.*)

3.

| | | | | | | |
|-----------------------|---|---|---|---|---|----------|
| Acetate of Rosaniline | . | . | . | . | . | 2 parts. |
| Water | . | . | . | . | . | 10 " |
| Alcohol | . | . | . | . | . | 1 part. |

(*Kwaysser and Husak.*)

The first two produce a violet, the last named a red copy.

Hyposulphite of Sodium for Cleaning Silver. B. F. Davenport. In a letter to *New Remedies*, the author recommends hyposulphite of sodium as a safe, cheap, and very efficient substance for cleaning silver.

A cloth or brush, wet with the saturated solution of this salt, even without the addition of any of the commonly-used cleansing powders, will remove all tarnish from a silver surface, in two to three rubs.

Label Varnish. R. Kirsten. (*Pharm. Zeitung*, 1881, No. 13.) The following formula yields an excellent varnish, which dries in a few seconds, leaving a colourless, even, shining, coat:—

| | | | | | | | |
|-------------------|---|---|---|---|---|---|-----------|
| Sandarac | . | . | . | . | . | . | 53 parts. |
| Mastic | . | . | . | . | . | . | 20 " |
| Camphor | . | . | . | . | . | . | 1 " |
| Oil of Lavender | . | . | . | . | . | . | 8 " |
| Venice Turpentine | . | . | . | . | . | . | 4 " |
| Alcohol | . | . | . | . | . | . | 40 " |
| Ether | . | . | . | . | . | . | 6 " |

Allow to macerate for several weeks, or until all is dissolved.

Bottling Wax Prepared from a Bye-product. J. F. Brown. (*Pharm. Journ.*, 3rd series, xi., 1003.) The balsam of tolu, which has been used for preparing the syrup, has hitherto been utilized only in making a varnish for pills, and it therefore accumulates in course of time to a considerable extent.

A composition useful as bottling wax may be prepared by stirring into the melted balsam one-tenth its weight of levigated bole. It sets quickly, with a fine glossy surface, and is less brittle than the wax generally employed.

A mixture of residual balsam, amber resin, of each 4 parts, Venice turpentine, vermilion, of each 1 part, melted together and well stirred, forms sealing wax of fair quality.

Aqueous Shellac Varnish. Dr. Geissler. (From *Pharmaceut. Centralhalle*, 1880.) Shellac is known to be soluble in solution of borax. Such a solution can be obtained by shaking one part of freshly powdered shellac with two to three parts of saturated solution of borax. Complete solution will thus be effected in two or three days. Bleached shellac must be preserved under water, and should be used immediately after being powdered; for if the powder be exposed to the air for a few days, it becomes less soluble and sometimes even quite insoluble. No heat should be applied in effecting the solution.

The varnish thus prepared answers well for imparting a gloss to

maps, pictures, prints, etc., and also for use in laundries in the place of starch gloss.

Caoutchouc Cement for Rubber Goods. (From *New Remedies*.) Dissolve 10 parts of caoutchouc, in small pieces, in 280 parts of chloroform, by maceration. Melt 10 parts more of finely cut caoutchouc with 4 parts of resin, add 1 part of turpentine, and dissolve the whole in 40 parts of oil of turpentine. Then mix the two solutions. For use, dip a piece of linen in the cement, and apply it to the torn article of rubber, which should also receive a layer of the cement before and after the application of the linen.

Solution of Hypochloride of Zinc as a Substitute for Liquor Sodæ Chlorinatæ. R. B. Fairthorne. (From *Amer. Journ. of Pharm.*) The advantages claimed for this solution over the official solution of chlorinated soda are that it is free from alkalinity, and consequently capable of being used in a more concentrated state if desired, and that, in addition to the properties of hypochlorites, it possesses the astringent and antiseptic properties of zinc compounds. The solution is prepared as follows :—

Chlorinated lime, 12 troy ounces ; sulphate of zinc, 24 troy ounces ; water, 12 pints. The chlorinated lime is triturated a little at a time with 8 pints of water, and the decanted clear liquid is mixed with the sulphate of zinc, previously dissolved in 3 pints of the water, and set aside for twelve hours ; the clear liquid, after straining the precipitate, is then made up with water to $11\frac{1}{2}$ pints of the finished product.

The Therapeutic Uses of Resorcin. Abstract of Dr. J. Andeer's pamphlet on resorcin. (*New Remedies*, Sept., 1880.) Some eighteen years ago a new chemical compound was obtained by Hlasiwetz and Barth, of Vienna, from certain resins by the action of fusing alkalis. The discoverers gave it the name resorcin, partly from the fact that it is derived from a resin, and partly because it has some similarity to orcin, a peculiar substance derived from archil. Some time afterwards, Körner prepared resorcin synthetically by treating paraiodophenol (obtained from dinitrobenzol), with fusing potassium hydrate ; but since then many other and cheaper methods of preparing it artificially have been discovered. Regarding the chemical constitution of resorcin, it is meta-dihydroxybenzol $C_6H_4(HO)_2$.

The first part of the pamphlet deals with the chemistry and the physical properties of this substance, a summary of which will be found in *New Remedies*, 269 and 270. We pass on at once to the therapeutic part of the subject.

From the relation of resorcin to phenol, the author concluded that the former body might possibly possess antiseptic properties similar to the latter. His preliminary experiments showed that it requires rather strong solutions of resorcin to arrest fermentation; yet a 1 per cent solution will prevent the decomposition of urine, even if exposed to the air, for months. On the other hand, even a dilute (1 per cent.) solution of resorcin is an energetic destroyer of the organic germs of putrefaction. Its efficiency was proved not only by applying the solution to putrescent matters directly, but also in this way, that some putrescent substance was injected into or otherwise caused to be absorbed by living animals, and the morbid symptoms afterwards arrested and removed by the application of resorcin.

Resorcin is not absorbed by the healthy, unwounded skin, nor does it, even when violently rubbed into it, either discolour it or produce symptoms of irritation or relaxation. Hypodermic injections, containing 2 per cent. of resorcin, produce, in fat and well-nourished persons, no reflex symptoms; but in lean and nervous persons, painful cramps and twitchings are observed. Abscesses have never been noticed. Concentrated solutions, when injected into the muscles, produce sometimes more or less decided symptoms of poisoning, at other times none at all. The effect is particularly severe when a larger vessel or lymphatic gland has been injected. Applied to the lips it produces no effect as long as they are dry; if they are wet, a white blister is raised. It does not affect the substance of the teeth.

Pharmacological Effects of Resorcin.—1. In abnormal fermentative processes, which are usually termed "putrefactive," it has proved to be a good antiseptic.

2. A 1 per cent. solution of resorcin prevents the decomposition of pancreas, blood, urine, and other easily putrescible substances. They retain their natural odour.

3. A 1 per cent. solution of resorcin soon arrests already existing decomposition; whether this is accomplished by a direct destruction of the cause of decomposition, or by coagulating the fluid which nourishes it, has not yet been determined.

4. In septic processes artificially produced in animals, resorcin (in 1 per cent. solution) acts, without local or constitutional effect, just as well as carbolic acid, without sharing the disadvantage of the latter, or of pyrogallie acid, to be absorbed by the circulation, and thereby causing an injury of its own.

5. Stab or cut wounds, purposely made in animals, if treated

with a 1 per cent. solution of resorcin, always heal by first intention.

6. Wounds of the cornea, conjunctiva, gums, and other mucous membranes, which are artificially irritated and infected by micro-organisms, after being canterized with resorcin, heal quickly without permitting the development of vital pathogenous germs or bacteria below the scab.

7. Artificial, sub-epidermoidal, or cutaneous abscesses or erysipelas yield to a proper treatment with resorcin, often in two or three days.

8. Resorcin, in 1 to 2 per cent. solution, has as little effect upon the healthy skin or mucous membrane as pure water, and never causes an eruption.

9. Resorcin is borne as well or better than any other antiseptic, particularly by the organs of respiration, which it does not in the least irritate.

Indications.—Resorcin is valuable in surgical technic in general, and in dental practice especially. It is an excellent remedy by way of inhalation. Administered by spray, it neither irritates the eyes of the operator (as carbolic acid does), nor the patient, and is almost odourless in this form. In abnormal fermentative processes of mucous membranes, a 1 to 2 per cent. solution speedily arrests the phenomena. It is also valuable as a caustic for catarrhal, tubercular, and syphilitic sores; in which cases it is best used in form of crystals applied to excrescences, particularly on mucous membranes; it removes them painlessly, and restores the membrane in three to four days to its normal condition. In form of powder or crystal it is a most efficient remedy in diphtheritic affections. A close observation and control of all cases treated for two years past with resorcin has furnished only positive results. The most difficult cases of this disease were cured in at most one week, completely and without injurious consequences. In purulent discharges of the sexual organs and of the ears, resorcin acts differently according to the nature of the discharge. If the latter is purely septic, or is a hyper-secretion, a 1 to 3 per cent. solution of resorcin acts as an efficient antiseptic; in purely fermentative discharges it is almost inert, and in mixed forms only moderately effective.

Dose and Mode of Application.—The usual dose for an adult, in mild cases and at the beginning of severe cases, is 1 to 2 grams (15 to 30 grains); in more severe cases, 3 to 5 grams (45 to 75 grains), dissolved in 100 gm. (about 3½ fl. oz.) of water. These doses may be divided, and be taken at intervals during the day, as a preventive against toxic influences.

The average maximum dose of resorcin, which is about 5 gm. (75 grains), either dissolved in 100 gm. of water, or in powder, should only be given in exceptional cases; that is, such where smaller doses have already been given previously with gradual increase, or where the quantity of septic material is comparatively large.

For exhibition in fluid form, the best vehicles are alcohol, glycerin, and syrup of orange. But it is preferable to exhibit it in powder enclosed in wafer or gelatin capsules, whereby its peculiar taste is completely masked. The following formulæ can be recommended :—

1. *Mixture (Mistura Resorcini).*

| | | |
|------------------------|---------|-----------|
| ℞ Resorcini Puri . . . | 0.5 gm. | 8 grains. |
| Aquæ Destillatæ . . . | 100.0 „ | 8 fl oz. |
| Syrupi Aurantii . . . | 30.0 „ | 1 „ |

M.

Dose.—A tablespoonful every two hours.

2. *Emulsion (Emulsio Resorcini).*

| | | |
|------------------------|---------|-----------|
| ℞ Resorcini Puri . . . | 0.5 gm. | 8 grains. |
| Amygdalæ Dulcis . . . | 20.0 „ | 5 5. |
| Syrupi Aurantii . . . | 30.0 „ | 1 fl oz. |

Fiat emulsio.

Dose.—A tablespoonful every two hours.

3. *Powder.*

| | | |
|------------------------|-------------|-------------|
| ℞ Resorcini Puri . . . | 0.3–0.5 gm. | 5–8 grains. |
|------------------------|-------------|-------------|

To be given in wafer or gelatin capsules.

Dose.—One powder every two hours.

4. *Resorcin Gauze (1½ per cent.)*

For 1 kilo (2½ lb.) of gauze use :—

| | | |
|--------------------|----------|---------------|
| Resorcin | 15.0 gm. | ½ oz. avoird. |
| Glycerin | 150.0 „ | 5 |
| Alcohol | 450.0 „ | 1 lb. |

5. *Resorcin Cotton (3 per cent.)*

For 1 kilo (2½ lb.) of cotton batting use :—

| | | |
|--------------------|----------|---------------|
| Resorcin | 30.0 gm. | 1 oz. avoird. |
| Glycerin | 70.0 „ | 1½ „ |
| Alcohol | 100.0 „ | 3½ „ |

6. *Resorcin Spray.*

| | | |
|------------------------|----------|------------|
| ℞ Resorcini Puri . . . | 5.0 gm. | 75 grains. |
| Aquæ Destillatæ . . . | 1000.0 „ | 82 fl. oz. |

Resorcin and Hydroquinone. (*Schweiz. Wochenschr. für Pharm.*, 1880, No. 33; *Pharm. Zeitung*, 1880, No. 90; *New Remedies*, April, 1881.) Dr. Andeer's experiments (see the foregoing article) point out the usefulness of resorcin as an antiseptic. It is now shown by Professor Lichtheim, of Berne, that this substance is also a powerful antipyretic, which in magnitude of effect and certainty is in some respects even superior to quinine and salicylic acid. On giving to a patient in high fever a dose of two to three grams of resorcin, its effects are noticed after a few minutes; dizziness and buzzing in the ears, reddening of the face, lustre of the eyes, acceleration of breathing and also of pulse, but the latter irregularly. After ten to fifteen minutes the skin begins to become moist, gradually the secretion increases, and after about fifteen minutes the patient is in a profuse perspiration. As soon as this appears, the before-mentioned symptoms of excitement disappear, and there ensues a rapid subsidence of the fever. The pulse decreases in frequency and the temperature falls, both being normal about one hour after the drug has been administered. The reduction of temperature amounts in such cases to about 3° C. and more, and the pulse is reduced by more than one-third. But while resorcin thus exhibits more powerful effects than quinine and salicylic acid, it has the disadvantage that the duration of these effects is comparatively short. Yet even this drawback alone would not seriously interfere with its common use as an antipyretic, for a drug capable of rapidly causing the subsidence of fever, even for a comparatively short time, would be highly valuable. The real objection is that resorcin causes symptoms of excitement, which in some cases are very prominent. The patients become delirious, their utterances become partly inarticulate and unintelligible, and sometimes a slight convulsive tremor of the hands and fingers is noticed. But these symptoms pass rapidly away, though they are disagreeable enough to retard the employment of resorcin internally as an antipyretic.

These results were also obtained and confirmed by Dr. L. Brieger, particularly so far as resorcin is concerned. With hydroquinone the results were more favourable; doses of 0.2 gram of the latter were sufficient to reduce the temperature without producing excitement; but on raising the dose to 0.8 to 1.0 gram, these symptoms made their appearance. The antifebrile effect of both resorcin and hydroquinone passes off rapidly in a short time. Hydroquinone has an advantage for hypodermic employment. Being entirely free from caustic properties, solutions of it produce no more pain or damage than injections of pure water. It is recommended to

employ a 10 per cent. solution, and to inject two hypodermic syringes full of this.

Resorcin as an Antiseptic. Dr. D. Beaumetz. (*New Remedies*, 1881, 152.) The author reports that, in ulcerations of all kinds, resorcin may be used as a topical application. He has dressed with it chancres and mucous patches, and obtained satisfactory results. In diphtheria it may replace carbolic acid, of which it has not the unpleasant smell. It may be useful in local affections of the stomach. Resorcin is poisonous in doses exceeding 6 or 7 grams, the toxic effect then produced being similar to those of carbolic acid.

In the author's opinion this substance may give good results in surgery as an antiseptic; but in medicine, where 2 grams may be given without danger, its efficacy has not yet been demonstrated. In fevers and acute rheumatism, it is no better than salicylate of sodium, and its only advantage over carbolic acid is its slight odour and taste.

Celluloid. (*Pharm. and Chem.*, 1880, 371.) Celluloid is made by dissolving pyroxyline (or gun cotton) in camphor, instead of ether or alcohol. To prepare it for treatment with the camphor it is first ground in water. After the water has drained off, it is placed under pressure in a perforated vessel, and almost converted into a solid body, which, however, still contains enough moisture to prevent spontaneous ignition in the subsequent operations. This mass is now intimately mixed with camphor by grinding them together in water. One part of camphor, by weight, is employed to two parts of pyroxyline, but other proportions can be employed with good results. The desired pigments and other substances are added along with the camphor. After they have all been very thoroughly mixed, the mass is subjected to a very heavy pressure, which removes all the moisture and also brings the camphor into more close contact with the pyroxyline to aid it in dissolving the latter. The dried and pressed mass is now put into a vessel of the form in which it is desired to have the celluloid. In the top of this vessel is a piston or plunger, so that it can be subjected to the action of a hydraulic press. While under pressure it is heated by steam or otherwise to from 140° up to 265° F., according to the quantity of the mixture. It is kept at this temperature and under this pressure until the camphor has dissolved all the pyroxyline. The temperature increases the solvent power, while the pressure keeps the ingredients in intimate contact. The result is a solid mass perfectly homogeneous throughout.

Artificial ivory is prepared from 100 parts of ivory dust, 100 of pyroxyline, and 50 of camphor. The pyroxyline is ground wet, then pressed until only enough water remains in it to prevent ignition. It is then mixed with the ivory dust and camphor, and pressed between absorbing cushions until all the moisture is extracted. Then 50 parts of nitrite of ethyl are added. The mixture is then left for several hours in a closed vessel until the nitrite is equally distributed throughout the mass. It is next subjected to heavy pressure in heated cylinders, as before described, and rolled between hot rollers. The product thus obtained has the appearance of natural ivory, is free from streaks and spots, is not attacked by moisture, and while hot can be pressed into any shape.

Celluloid as it leaves the press is about as dense as sole leather, but hardens in the air, owing to a slight evaporation of camphor. In the finished product there is still a good deal of camphor, and herein is found the essential advantage in the use of camphor over ether, alcohol, and other liquid or volatile solvents. All such solvents are completely removed from the mass, while enough camphor remains in it perpetually to serve as solvent over and over again, and to give it the property of being readily changed into any other shape at a high temperature without the addition of any other solvent.

By another process a dilute solution of camphor is employed, 1 part of camphor to 8 of alcohol, which will not dissolve pyroxyline at common temperatures, but does so when heated. The pyroxyline is ground, mixed with pigment or dye, the water all removed, and 1 part of the solvent added to 2 parts of pyroxyline, well stirred and put in a closed vessel until the solvent has saturated all parts of it. It is then heated under pressure as before described. The Compagnie Franco-Americaine has been making celluloid for over three years, near Paris, and has a branch at Mannheim, in Baden. The rubber comb company in Hanover also took up its manufacture, but abandoned it again, owing, it is said, to the danger from fire. Renleaux is of the opinion that some experimenter should contrive a method for dispensing with the camphor, and also rendering the pyroxyline less combustible; two difficult problems which Professor Wagner believes are not likely to be accomplished.

Unlike hard rubber, celluloid does not become electrical when rubbed. The odour of camphor can only be noticed when the substance is warmed, or on being rubbed. The numerous uses to which it is applied are too well-known to need repetition here.

Precautions to be Observed in the Preparation of Coloured

Fires. (*Pharmaceut. Zeitung*, 1880, No. 55). To guard against spontaneous combustion of these mixtures, the following precautions should be observed:—The sulphur to be employed should not be flowers of sulphur, but finely powdered and washed roll sulphur. All the other ingredients ought to be separately reduced to fine powders and well dried, the whole then well mixed with the hands and passed through a sieve to remove any lumps yet present. The mixtures should be kept in dry tin boxes.

BIBLIOGRAPHY.

**COMPRISING TITLES OF BOOKS, PAMPHLETS, ETC.,
ON CHEMISTRY, BOTANY, MATERIA MEDICA,
PHARMACY, AND ALLIED SUBJECTS,**

PUBLISHED BETWEEN JULY 1ST 1830, AND JUNE 30TH 1831.

PART IV.

BIBLIOGRAPHY.

CHEMISTRY.

Chemistry: General, Medical, and Pharmaceutical, including the Chemistry of the British Pharmacopœia. By Prof. J. Attfield, F.R.S. Ninth Edition. Post 8vo, pp. 900. Published by Van Voorst.

Ausführliches Lehrbuch der pharmaceutischen Chemie. Mit zahlreichen in den Text eingedruckten Holzstichen und einer farbigen Spectraltafel. Von Dr. Ernst Schmidt. In zwei Bänden. Erster Band: Anorganische Chemie. Zweiter Band: Organische Chemie. Braunschweig. Verlag von F. Vieweg und Sohn, 1881.

Manuel de chimie médicale et pharmaceutique. Par Alfred Riche, professeur de chimie à l'Ecole supérieure de pharmacie de Paris. Chez Germer-Baillière, 108, boulevard Saint-Germain, et chez Firmin-Didot, 56, rue Jacob.

Lehrbuch der pharmaceutischen Chemie. Von Dr. H. Schwanert. In drei Bänden, mit zahlreichen Illustrationen. Braunschweig, 1880. C. A. Schwetschke und Sohn.

An Introduction to Pharmaceutical and Medical Chemistry. Part I. (Theoretical and Descriptive). Arranged on the Principle of the Course of Lectures on Chemistry as Delivered at the South London School of Pharmacy. By Dr. John Muter, M.A., F.C.S., F.I.C., etc. Second Edition, Re-arranged. London. Published at the School. 1880, royal 8vo, pp. 216.

Chemistry of Medicine: Practical Text and Reference Book for the Use of Students, Physicians, and Pharmacists. By J. U. Lloyd. 12mo, pp. 400. Cincinnati.

Aids to the Chemistry and Tests of the Pharmacopœia. By J. Davidson. 12mo. Published by Fannin (Dublin).

Chemical Vade Mecum for Medical Students. By G. Jones. London. Published by H. Kimpton. 1881.

Introduction to the Study of Chemical Reactions. By Dr. phil. Edmund Drechsel, Professor of Physiological Chemistry at Leipzig University. Translated with permission of the author and of the publisher, and specially adapted to the use of American students by notes, etc. By N. Fred Merrill, S.B., Ph.D. New York: John Wiley & Sons. 1880. 12mo, pp. 138.

Technik der Experimentalchemie. Anleitung zur Ausführung chemischer Experimente beim Unterricht an niederen und höheren Schulen für Lehrer und Studierende; von Dr. Rudolph Arendt. Erster Band, 1 und 2 Lieferung. Mit zahlreichen in den Text gedruckten Holzschnitten. Leipzig. Verlag von Leopold Voss. 1880. Gross Octav, jede Lieferung 96 Seiten.

Cours de Chimie. Classe de philosophie. Par A. Biche. 12mo. Paris.

Grundriss der Chemie gemäss der neueren Ansichten von C. F. Rammelsberg. 5. Aufl. Verlag von Habel in Berlin.

Grundriss der Chemie von E. Altmann. 1. Th. Anorg. Chemie. Verlag von Scholtze in Leipzig.

Ideal Chemistry: A Lecture. By Sir B. C. Brodie. Post 8vo, pp. 64. Published by Macmillan.

Inorganic Chemistry adapted for Students in the Elementary Classes of the Science and Art Department. (Elementary Science Series.) By W. B. Kemshead. Enlarged Edition, revised and extended. 12mo, pp. 294. Published by Collins.

Inorganic Chemistry. Eleven Years' Papers worked out as Models. (Science and Art Department, South Kensington.) By G. N. Stokes. 12mo. Published by Stewart.

Beiträge zur Kenntniss der unorganischen Schmelzverbindungen von O. Schott. Verlag von Vieweg und Sohn in Braunschweig.

Ueber Ziel und Methode des chemischen Unterrichts von F. Wilbrand. Verlag von Lax in Hildesheim.

The Atomic Theory. By *Ad. Wurtz*. Translated by *E. Cleminshaw*, F.C.S., F.I.C. London: C. Kegan Paul & Co.

Experimental Chemistry for Junior Students. By *J. E. Reynolds*. Part I. Introductory. 18mo, pp. 144. Published by Longmans.

Exercises in Practical Chemistry. By *A. G. V. Harcourt and H. G. Madan*. Vol. I. Elementary Exercises. Third edition, revised by *H. G. Madan*. Post 8vo, pp. 484. Published by Frowde.

The Student's Handbook of Chemistry. With Tables and Chemical Calculations. By *H. L. Greville*. 12mo, pp. 514. Published by Livingstone (Edinburgh).

Chemistry: Organic and Inorganic, Elementary and Advanced, worked out in full as Models. (Stewart's Educational Series.) By *G. N. Stokes and E. G. Hooper*. Post 8vo, pp. 128. Published by Stewart.

Introduction to the Study of Organic Chemistry. By *H. E. Armstrong*. Second edition. 12mo, pp. 340. (Text Books of Science). Published by Longmans.

The Rise and Development of Organic Chemistry. By *Prof. C. Schorlemmer*. 8vo, pp. 124. Manchester and London.

Lecture Notes for Chemical Students. Vol. II. Organic Chemistry. By *Prof. E. Frankland, F.R.S.* Third edition, revised by *F. R. Japp*. Post 8vo, pp. 310. Published by Van Voorst.

Elements of Chemistry, Theoretical and Practical. Part III.: Chemistry of Carbon Compounds; or, Organic Chemistry. Section I. By *W. & A. Miller*. Fifth edition. 8vo, pp. 1068. Published by Longmans.

Text-Book of Practical Organic Chemistry. For Elementary Students. (Educational Course.) By *H. C. Jones*. 12mo, pp. 104. Published by Hughes.

Traité de Chimie organique. Par *MM. Berthelot et Jungfleisch*.

Handbuch der organischen Chemie. Von *Dr. F. Beilstein*, Professor der Chemie am technologischen Institute zu St. Petersburg. Leipzig, Verlag von Leopold Voss. 1880.

Lehrbuch der organischen Chemie, von Prof. Dr. J. Lorscheidt, Rector der höheren Bürgerschule zu Eupen. Herder's Verlagsbuchhandlung zu Freiberg im Breisgau.

Pharmakologische Studien über schwefelsaures Methylestrychnin von J. Faure. Verlag von Karow in Dorpat.

Die wichtigsten Thatsachen der Chemie der Carbonide von J. M. Fuchs. 2 Aufl. Verlag von Kellerer in München.

Chemie der Benzolderivate oder der aromatischen Substanzen von A. Kekulé. Verlag von Enke in Stuttgart.

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Contributions à la Pharmacie et à la Therapeutique. Par S. Limousin. 8vo, pp. 337. Paris.

L'Officine ou Répertoire de Pharmacie pratique. Par Dorvault. 10^e édition. Paris, P. Asselin, 1880.

Selecta e Præscriptis. Selections from Physician's Prescriptions. By J. Pereira. 17th edition. 32mo, pp. 356. Published by Churchill.

Metric Prescription Book: Aid in Metric Prescription Writing. By O. Oldberg. 12mo, pp. 180. Philadelphia.

Supplement to the American Dispensatory. By John King, M.D., Professor of Obstetrics and Diseases of Women and Children in the Eclectic Medical Institute of Cincinnati, etc.; and John U. Lloyd, Professor of Chemistry and Pharmacy in the Eclectic Medical Institute of Cincinnati. 8vo, pp. iv., 202. Cincinnati: Wilstach, Baldwin & Co., 1880.

A Compendium of Modern Pharmacy and Druggists' Formulary. By Walter B. Kilner, Springfield, Ill. 1880, 8vo, pp. 478.

Die wissenschaftliche Ausbildung des Apothekerlehrlings und seine Vorbereitung zum Gehülfenexamen. Mit Rücksicht auf die neuesten Anforderungen bearbeitet von O. Schlickum. Zweite verbesserte und stark vermehrte Auflage. Mit 560 Holzschnitten und einer Vegetationskarte. Leipzig. Ernst Günther's Verlag. 764 Seiten.

Nouveau Recueil de règlements relatifs à la pharmacie. Par. M. S. Roche. Librairie médicale de J. P. Mégret, 58, quai de l'Hôpital, à Lyon.

Die reichsgesetzlichen Bestimmungen über die Ausbildung und Prüfungen der Apotheker und Apothekergehilfen. Nebst einem Anhang, enthaltend die darauf bezüglichen Preussischen Ministerial-Verfügungen. Berlin, 1880. R. v. Decker's Verlag, Marquardt und Schenk.

Die Apotheken-Gesetzgebung des deutschen Reiches und der Einzelstaaten, auf der Grundlage, der allgemeinen politischen Handels- und Gewerbegesetzgebung dargestellt. Herausgegeben und mit ausführlichen Erläuterungen versehen von Dr. H. Böttger, Redacteur an der Pharmaceutischen Zeitung. II Band: Landgesetzgebung. Berlin. Verlag von Julius Springer. 268 Seiten.

Nogle Bemaerkninger om den nuvaerende pharmaceutiske Uddannelse i Danmark och Udlandet samt et Forslag til en forbedret Uddannelse af Pharmaceuterne i Danmark. Af H. J. Möller. København. H. Hagerups Boghandel. 1881. 137 p., gr. Octav.

Annuaire des spécialités médicales et pharmaceutiques. Deuxième année. Aux bureaux de l'Annuaire, 20, rue de Tournon.

Pharmaceutischer Kalender für das Deutsche Reich auf das Jahr 1881. Mit Notizkalender zum täglichen Gebrauch nebst Hilfsmitteln für die pharmaceutische Praxis. Mit einer Beilage: Pharmaceutisches Jahrbuch. Zehnter Jahrgang (XXI. Jahrg. des Pharm. Kalenders für Norddeutschland). Berlin, 1881. Verlag von Julius Springer.

Thierärztliche Receptirkunde und Pharmacopoe, nebst einer Sammlung bewährter Heilformeln, von Erdmann & Hertwig. 4 Aufl. Verlag von Hirschwald in Berlin.

Wiener Recept-Taschenbuch. Dr. Carl Czuberka. Eine Sammlung der in den Wiener Kliniken und Ambulatorien des Wiener k. k. allgemeinen Krankenhauses am meisten verordneten Receptformeln der k. k. Professoren und Docenten: Arlt, Bamberger, Benedikt, Billroth, G. Braun, C. Braun, Drasche, Duchek, Dumreicher, Gruber, Hebra, Jaeger, Meynert, Scheff, Schlager, Schrötter, Seegen, Sigmund, Spaeth, Widerhofer, Zeissl und Zsigmondy. Nebst einem Anhang über Vergiftungen. Sechste Auflage. Wien, Druck und Verlag von Carl Fromme, k. k. Hofbuchdruckerei, 1881.

Proceedings of the American Pharmaceutical Association at the Twenty-eighth Annual Meeting. 1880. Philadelphia: Sherman & Co.

New York State Pharmaceutical Association. Proceedings of the Second Annual Meeting, held in Syracuse, May 19th and 20th, 1880. Also the Constitution, By-laws, Proposed Pharmacy Law, and Roll of Members.

Proceedings of the Pennsylvania Pharmaceutical Association at its Third Annual Meeting, held in Allentown, June 8th and 9th, 1880. With the Constitution, By-laws, and Roll of Members. 8vo, pp. 74.

Proceedings of the Tenth Annual Meeting of the New Jersey Pharmaceutical Association. Held in Jersey City, May 19th and 20th, 1880. Camden, 1880, 8vo, pp. 52.

Proceedings of the Wisconsin Pharmaceutical Association. First Annual Meeting held in Madison, July 14th and 15th, 1880.

Proceedings of the California Pharmaceutical Society and College of Pharmacy, and Report of the Eleventh Annual Meeting, held at San Francisco, Jan. 9th, 1880.

Proceedings of the Convention of Druggists, and of the First Meeting of the Illinois Pharmaceutical Association, held at Springfield, Dec. 7th and 8th, 1880. 8vo, pp. 87.

Proceedings of the Second Annual Meeting of the Texas State Pharmaceutical Association, held in the City of Galveston, May 13th and 14th, 1880.

Proceedings of the Ohio State Pharmaceutical Association at its Second Meeting, held at Dayton, O., May 19th, 1880. Cleveland, O. Pp. 32.

Proceedings of the Convention of Druggists and of the North Carolina Pharmaceutical Association. Munroe, N. C. Pp. 25.

Proceedings of the Connecticut Pharmaceutical Association at the Fourth Annual Meeting, held in New Haven, Feb. 4th, 1880. Pp. 75.

Proceedings of the Missouri State Pharmaceutical Association, held at Moberly, Oct. 26th, 1880. 8vo, pp. 16.

MAGNETISM, ELECTRICITY, HEAT, LIGHT, ETC.

Magnetism and Electricity. (Collins' Advanced Series.) By F. Guthrie. New edition. 12mo, pp. 360. Published by Collins.

Handbooks to Diagrams in Magnetism and Electricity. By W. Lees. Sheet I.: Magnetism. Sheet II.: Frictional Electricity. 12mo. Published by W. and A. K. Johnston.

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Electricity and Heat, being Articles contributed to the *Encyclopædia Britannica*. By *Sir W. Thomson*. 4to, pp. 66. Published by Blackie.

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Leitfaden für den Unterricht in der Physik. Von *C. Baenitz*. Verlag von Stubenrauch in Berlin.

MISCELLANEOUS SUBJECTS.

Report of the Annual Meeting of the British Association at Swansea. Swansea: Tweney & Co.

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Characteres mineralogici. Charakteristik der Classen, Ordnungen und Familien des Mineralreiches von *A. Weisbach*. Verlag von Engelhardt in Freiberg.

Revue der Fortschritte der Naturwissenschaften, Herausgegeben unter Mitwirkung hervorragender Fachgelehrten von *Dr. H. J. Klein*. Neue Folge. Erster Band. Physik. Köln und Leipzig. Verlag von Eduard Heinrich Mayer. 1881. Jedes Jahr erscheint ein weiterer Band in 4 Heften, Die Reihenfolge der einzelnen Fächer soll sein: Physik, Astronomie, Meteorologie, Chemie, Botanik, Urgeschichte, und Darwinismus.

Practical Photography: Being the Science and Art of Photography Developed for Amateurs and Beginners. By *O. E. Wheeler*. Illustrated. Post 8vo, pp. 266. Published at the Bazaar Office.

The Microscope, and its Relation to Medicine and Pharmacy. Edited and published by *Dr. C. H. Stowell* and *L. R. Stowell*. Detroit: *G. S. Davis*.

Leitfaden zur Anfertigung mikroskopischer Dauerpräparate. Von *O. Bachmann*, Lehrer an der Kreis-Ackerbauschule in Landsberg a.L. Mit 87 Abbildungen. München. Verlag von R. Oldenbourg.

Zeitschrift für mikroskopische Fleischschau und populäre Mikroskopie. Unter Mitwirkung hervorragender Mikroskopiker herausgegeben und redigirt von *H. C. J. Duncker*. Berlin.

Lehrbuch der practischen Toxicologie für practische Aerzte und Studirende. Mit Berücksichtigung der gerichtsaerztlichen Seite des Faches, bearbeitet von *Dr. F. A. Falck*, Prof. der Pharmacologie an der Universität zu Kiel. Stuttgart. Verlag von Ferd. Enke, 1880. 340 Seiten.

Food for the Invalid; the Convalescent, the Dyspeptic, and the Gouty. By *J. Milner Fothergill*, M.D., Edin., etc.; and *Horatio C. Wood*, M.D., etc. New York: Macmillan & Co., 1880, 8vo, pp. 157.

Die Bedeutung von Fleischnahrung und Fleischconserven mit Bezug auf Preisverhältnisse. Beitrag zur rationellen Verpflegung vom sanitären und wirthschaftlichen Standpunkte für Aerzte und Beamte von *Dr. Franz Hofmann*, o. ö. Professor und Vorstand des hygienischen Instituts der Universität Leipzig. Leipzig, Verlag von F. C. W. Vogel, 1880. 120 S. in Octav.

On the Digestive Ferments, and the Preparation of and Use of Artificially Digested Food. Lumleian Lectures for 1880. By *Dr. W. Roberts*. 8vo. Published by Smith & Elder.

La Médecine des Ferments; appliquée publiquement en 1861 au moyen des Antiferments: Acide phénique, Ac. salicylique, Phénate d'Ammoniaque, Sulfophénique, Iodophénique, Alcool, Arsenic, Mercure, Phosphore, Quinine, Soufre, Fer; par le Dr. Déclat.

Ueber. Conservierungsmittel, insbesondere über die Verwendung der Salicylsäure für Bier und Wein. Vortrag, gehalten von Apotheker *R. Jacobi* in Elberfeld im Gewerbeverein zu Cöln. Elberfeld, Baedeker'sche Buchhandlung.

Anton Fischer's Likör-Fabrikation in ihrem ganzen Umfange. Vollständiges Hand- und Hilfsbuch, enthaltend 1200 Recepte zur Bereitung aller Sorten einfacher und Doppelbranntweine, von Usquebaugh, Magentropfen, Essenzen und Tincturen, Extract, Rum, Punsch, Arak, Cognac, Franzbranntwein, Alkoholaten und Wässern, sowie von Huiles. Für Branntweinbrenner, Conditoren, Destillateure, Restaurants, Gast- und Schenkwirthe, sowie für Kaufleute. Nebst einer Anleitung zur Darstellung der Liqueure auf warmem und kaltem Wege. In dritter vermehrter und verbesserter Auflage herausgegeben von *Dr. Fritz Elsner*, Redacteur "Elsner's Chemisch-techn. Mittheilungen." Mit in den Text gedruckten Abbildungen. Halle, Verlag von Wilhelm Knapp. 1881.

Die Fabrikation der moussirenden Getränke und der künstlichen Mineralwässer. Praktische Anleitung zur Fabrikation aller moussirenden Wässer, Limonaden, Weine, etc. und gründliche Beschreibung der hierzu nöthigen Apparate. Mit 20 Abbildungen. Von *Oskar Meitz*. Verlag von A. Hartleben in Wien.

Aërated Waters, and How to Make Them. By J. Gould. London :
Published by J. Gilbert Smith.

Handverkaufs Taxe für Apotheker. Bearbeitet von Dr. Carl Bedall,
Apotheker, ausserord. Mitglied des Kgl. Bayr. Ober-Medicinal-
Ausschusses. Dritte vollständig umgearbeitete Auflage.
München, 1881. Verlag von Julius Grubert.

The Chemists and Druggists' Diary for 1881. London : Office of the
Chemist and Druggist. 1880.

TRANSACTIONS
OF THE
British Pharmaceutical Conference
AT THE
EIGHTEENTH ANNUAL MEETING
AT
YORK,
1881.

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British Pharmaceutical Conference.

CONSTITUTION.

Art. I. This Association shall be called The British Pharmaceutical Conference, and its objects shall be the following:—

1. To hold an annual Conference of those engaged in the practice, or interested in the advancement, of Pharmacy, with the view of promoting their friendly reunion, and increasing their facilities for the cultivation of Pharmaceutical Science.
2. To determine what questions in Pharmaceutical Science require investigation, and when practicable, to allot them to individuals or committees to report thereon.
3. To maintain uncompromisingly the principle of purity in Medicine.
4. To form a bond of union amongst the various associations established for the advancement of Pharmacy, by receiving from them delegates to the annual Conference.

Art. II.—Membership in the Conference shall not be considered as conferring any guarantee of professional competency.

RULES.

1. Any person desiring to become a member of the Conference shall be nominated in writing by a member, and be balloted for at a general meeting of the members, two-thirds of the votes given being needful for his election. If the application be made during the recess, the Executive Committee may elect the candidate by a unanimous vote.

2. The subscription shall be 7s. 6d. annually, which shall be due in advance upon July 1.

3. Any member whose subscription shall be more than two years in arrear, after written application, shall be liable to be removed from the list by the Executive Committee. Members may be expelled for improper conduct by a majority of three-fourths of those voting at a general meeting, provided that fourteen days' notice of such intention of expulsion has been sent by the Secretaries to each member of the Conference.

4. Every association established for the advancement of Pharmacy shall, during its recognition by the Conference, be entitled to send delegates to the annual meeting.

5. The Officers of the Conference shall be a President, four Vice-presidents by election, the past Presidents (who shall be Vice-presidents), a Treasurer, two General Secretaries, one local Secretary, and nine other members, who shall collectively constitute the Executive Committee. Three members of the Executive Committee to retire annually by ballot, the remainder being eligible for re-election. They shall be elected at each annual meeting, by ballot of those present.

6. At each Conference, it shall be determined at what place and time to hold that of the next year.

7. Two members shall be elected by the Conference to audit the Treasurer's accounts, such audited accounts to be presented annually.

8. The Executive Committee shall present a report of proceedings annually.

9. These rules shall not be altered except at an annual meeting of the members.

10. Reports on subjects entrusted to individuals or committees for investigation shall be presented to a future meeting of the Conference, whose property they shall become. All reports shall be presented to the Executive Committee at least fourteen days before the annual meeting.

. *Authors are specially requested to send the titles of their Papers to The Secretary, Brit. Pharm. Conf., 17, Bloomsbury Square, London, W.C., two or three weeks before the Annual Meeting. The subjects will then be extensively advertised, and thus full interest will be secured.*

FORM OF NOMINATION.

I Nominate

Name)

(Address)

as a Member of the British Pharmaceutical Conference.

..... Member.

Date

This or any similar form must be filled up legibly, and forwarded to The Secretary, Brit. Pharm. Conf., 17, Bloomsbury Square, London, W.C., who will obtain the necessary signature to the paper.

Pupils and Assistants, as well as Principals, are invited to become members.

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 Verity, Mr. R., Address unknown.
 Vickers, Mr. Thomas, Beverley, Yorks.
 Vince, Mr. J., 37, Cheapside, Lancaster.
 Virgo, Mr. C., The Foregate, Worcester.
 Vizer, Mr. E. B., Belgrave House, Church Road, Cliftonville, Brighton.
 Voce, Mr. W. G., 52, Haleswen Road, Netherton, near Dudley.
 Voelcker, A., Ph.D., F.R.S., etc., 39, Argyll Road, Kensington, W.

Wakefield, Mr. C. H., Blackmore House, Malvern Wells.
 Wakeham, Mr. C., Helston.
 Walker, Mr. B. A., 26, Clapham Road, S.W.
 Walker, Mr. C., 8, Cannon Street Road, E.
 Walker, Mr. J., 200, Manchester Road, Bradford, Yorkshire.
 Walker, Mr. J., 149, Widemarsh Street, Hereford.
 Walker, J. F., M.A., F.I.C., F.C.S., 16, Gilligate, York.
 Walker, Mr. T., Uddingston, near Glasgow.
 Wallace, Mr. W., 71, St. Vincent Street, Glasgow.
 Wallwork, Mr. J., 94, Elliott Street, Tyldesley, near Manchester.
 Walpole, Mr. W., White Lion Road, Yarmouth.
 Walsh, Mr. J. E., Tnunbridge Wells.
 Walton, Mr. E. B., Richmond, Yorks.
 Walton, Mr. J., 298, High Street West, Sunderland.
 Walton, Mr. M. F., West End, Sowerby Bridge.
 Walton, Mr. R., High Street, Maidenhead.
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 Wand, Mr. T., 20, Layerthorpe, York.
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 Ward, Mr. J. S., 2, High Street, Ilfracombe.
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 Watson, Mr. J. (Messrs. Hirst & Co.), Aire Street, Leeds.
 Watson, Mr. J. E. H., Rose Corner, Norwich.
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- Watson, W. H., F.C.S., F.R.M.S., Braystones, Beckermont, Carnforth.
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Watts, Mr. J., Dudley Hill, Bradford, Yorks.
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Welch, Mr. T., Address unknown.
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While, Mr. W. J., 123, London Street, Reading.
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White, Mr. E. A., Mayfield, Sussex.
White, Mr. F., London Road, Nottingham.
White, Mr. J. D., 7, Guildhall Square, Carmarthen.
White, Mr. J. W., 52, Royal York Crescent, Clifton, Bristol.
White, Mr. W., 15, Westgate, Bradford, Yorks.
Whitfield, Mr. H., Address unknown.
Whitfield, J., F.C.S., 113, Westborough, Scarborough.
Whitford, Mr. J. G. P., 20, Mardyke Parade, Cork.
Whiting, Mr. I., Stoney Stanton Road, Coventry.
Whitrow, Mr. B., 15, St. James's Terrace, Winchester.
Whittaker, Mr. E., 32, Regent Road, Salford, Lancs.
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Whyte, Mr. W., 110, Trongate, Glasgow.
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Wild, Mr. F., 299, Oxford Street, Manchester.
Wild, Mr. J., Clarendon Place, Hyde, Cheshire.
Wilday, Mr. G. E., Address unknown.
Wildsmith, Mr. E., 94, West Street, Leeds.
Wilford, Mr. J., 7, Lower Parliament Street, Nottingham.
Wilkes, Mr. J. S., 236, Broad Street, Birmingham.
Wilkinson, Mr. B. J., 1, Middleton Road, Kingsland, E.
Wilkinson, Mr. G., 267, Waterloo Road, Manchester.
Wilkinson, Mr. R., High Street, Kippax, near Leeds.
Wilkinson, Mr. T., 270, Regent Street, W.
Wilkinson, Mr. W., 114, Lambeth Walk, S.E.
Wilkinson, Mr. W., Hope Street, Crook, Durham.
Wilkinson, Mr. W., 263, Cheetham Hill, Manchester.
Wilkinson-Newsholme, Mr. G. T., 74, Market Place, Sheffield.
Wilks, Mr. M., 70, Market Place, Burnley, Lancs.

- Will, Mr. W. W., 80, Lower Hall Street, Montrose, N.B.
 Willan, Mr. R., 5, Market Street, Ulverston.
 Willan, Mr. W., 8, Friargate, Preston, Lancs.
 Williams, Mr. O. J., 4, St. John's, Warwick.
 Williams, Mr. E., Cerrig-y-Druidion, Denbighshire.
 Williams, Mr. E., 10, Wrexham Street, Mold.
 Williams, J., F.I.C., F.C.S., 16, Cross Street, Hatton Garden, E.C.
 Williams, Mr. J., 72, Camp Hill, Birmingham.
 Williams, Mr. J., Victoria Road, Aldershot.
 Williams, Mr. J. D., Turret House, Bodmin, Cornwall.
 Williams, Mr. J. J., 14, Clifton Villas, Maida Hill, W.
 Williams, Mr. J. P., 92, New Street, Aberavon.
 Williams, Mr. J. T., Nelson Street, Swansea.
 Williams, Mr. J. V., 95, Old Town Street, Plymouth.
 Williams, Mr. J. W., 6, Giltspur Street, E.C.
 Williams, M. E., M.D., 91, Hoxton Street, N. [Kensington].
 Williams, M. Whitley, F.I.C., F.C.S., 18, Kempford Gardens, South
 Williams, Mr. R., St. Clears, Carmarthenshire.
 Williams, Mr. T., 11, Bute Street, Cardiff.
 Williams, Mr. T. N., Cardiff Road, Aberaman.
 Williams, Mr. W., 265, Crown Street, Liverpool.
 Williams, Mr. W., Llanfyllin.
 Williams, Mr. W. D., High Street, Hampstead, N.W.
 Williams, Mr. W. H., Address unknown.
 Williams, Mr. W. H., Hayle, Cornwall.
 Williams, Mr. W. J., 137, Cannon Street, E.C.
 Willis, Mr. B. W., 25, The Brittox, Devises.
 Willis, Mr. C., 55, High Street, King's Lynn.
 Willmott, Mr. W., King's College Hospital, W.C.
 Willmott, Mr. W., The Brewery, Sheffield.
 Wills, Mr. G. S. V., Gladstone House, St. George's Rd., Southwark, S.E.
 Willsher, Mr. S. H., High Street, Tenterden.
 Wilson, Mr. C. F., 23, Liverpool Road, Stoke-on-Trent.
 Wilson, Mr. G., 40, Cathcart Street, Greenock, N.B.
 Wilson, Mr. J., General Infirmary, Derby.
 Wilson, Mr. J., Penrith, Cumberland.
 Wilson, Mr. J., 34, Charlotte Street, Leith, N.B.
 Wilson, Mr. J. H., 5, West Park, Harrogate.
 Wilson, Mr. J. M., 16, Loven Street, Edinburgh.
 Wilson, Mr. T., Stowmarket.
 Wilson, Mr. T. W., Bootham, York.
 Wilson, Mr. W., 21, High Street, Hanley, Staffordshire.
 Wing, Mr. G. N., Melton Mowbray.
 Wing, Mr. Lewis, Chislehurst, W., Kent.
 Wink, Mr. J. A., 5, Barge Yard, Bucklersbury, E.C.
 Witherington, Mr. S. H., Address unknown.
 Wood, Mr. A., New Brentford.
 Wood, Mr. A., 6, London Road, Sheffield.
 Wood, C. H., F.I.C., F.C.S., Mildmay Chambers, 82, Bishopsgate St., E.C.
 Wood, Mr. F., 18, Clarence Street, Cheltenham.
 Wood, Mr. R., 25, Mill Street, Macclesfield.
 Wood, Mr. W., Pontypool.
 Wood, Mr. W. A., 81, Church Street, Hunslet, Leeds.
 Woodcock, Mr. J., 15, Southgates, Leicester.
 Woodcock, Mr. P. D., Calvert Street, Norwich.
 Woodcock, R. C., F.I.C., F.C.S., 23, Abingdon St., Westminster, S.W.
 Woodhead, Mr. J. T., 29, Paradise Street, Liverpool.
 Woodhead, W. H., M.D., 58, Grosvenor Street, Manchester. [Rd., W.
 Woodland, J., F.L.S., F.C.S., Grosvenor Villa, Devonport Rd., Uxbridge
 Woodland, Mr. W. F., Fore Street, Chard, Somersetshire.

- Woodward, Mr. J. L., Bridgewater.
 Woolcott, Mr. C., 49, Upper Parade, Leamington.
 Woolley, Mr. G. S., 69, Market Street, Manchester.
 Woolley, Mr. Hermann, 69, Market Street, Manchester.
 Woolrich, Mr. C. B., Uttoxeter, Staffs.
 Wooster, Mr. J. R., 4, Broadway, Turnham Green, W.
 Wootton, Mr. A. C., 44a, Cannon Street, E.C.
 Wootton, Mr. P., Market Place, Luton, Beds.
 Worrall, Mr. T. W., 11, Theatre Street, Preston.
 Worth, Mr. E., Town Hall, Bournemouth.
 Worthington, Mr. W., 45, Kennington Road, Southport. [Tyne.
 Wright, A., A.K.C., 8, Bentinck Crescent, Elswick Road, Newcastle-on-
 Wright, C. R. A., D.Sc., F.I.C., F.C.S., St. Mary's Hospital, W.
 Wright, Mr. G., 102, High Street, Burton-on-Trent.
 Wright, Mr. G. H., 66, Oakfield Road, Anerley, S.E.
 Wright, Mr. J., 46, Bridge Street, Leeds.
 Wright, Mr. W. O., 55, Great Scotland Road, Liverpool.
 Wrigton, Mr. T. H. G., Market Place, Cannock.
 Wyatt, Mr. H., 20, Derby Road, Bootle, Liverpool.
 Wyborn, Mr. J. M., 59, Moorgate Street, E.C.
 Wylde, Mr. S., 160, Richmond Row, Liverpool.
 Wyles, Mr. W., 1, New Bridge, Dover.
 Wyley, Mr. J., Coventry.
 Wyley, Mr. W. F., Hertford Street, Coventry.
 Wylie, Mr. D. N., 1, South College Street, Edinburgh.
 Wylie, Mr. T., Port Glasgow.
 Wyllie, Mr. A., Address unknown.
 Wyman, Mr. J., Charles Street, Farringdon Road, E.C.
 Wynne, Mr. E. P., 3, Pier Street, Aberystwith.

 Yates, Mr. D., 32, Darwen Street, Blackburn.
 Yates, Mr. F., 64, Park Street, Southwark, S.E.
 Yeomans, Mr. J., 22, Petty Cury, Cambridge.
 Yewdall, Mr. E., 56, Wade Lane, Leeds.
 Young, C., F.R.C.S., Edin., 50, Ann Street, Dundee.
 Young, Mr. D., 30, West Market Place, Cirencester.
 Young, Mr. J., 16, Gallowtree Gate, Leicester.
 Young, Mr. J., 20, High Street, Newport, Mon.
 Young, Mr. J., Folds Road, Bolton.
 Young, J. R., F.C.S., Sankey Street, Warrington.
 Young, Mr. J. R., 17, North Bridge, Edinburgh.
 Young, Mr. R. F., New Barnet.

NOTICE.

Members are requested to report any inaccuracies in these lists by letter, addressed as follows:—

THE SECRETARY,
 BRIT. PHARM. CONF.,
 17, Bloomsbury Square,
 London, W.C.

SOCIETIES AND ASSOCIATIONS

INVITED TO SEND DELEGATES TO THE ANNUAL MEETING.

The Pharmaceutical Society of Great Britain.

The North British Branch of the Pharmaceutical Society of Great Britain.

The Pharmaceutical Society of Ireland.

- ABERDEEN.**—Society of Chemists and Druggists (1839). Mr. A. Strachan, 111, George Street, Aberdeen.
- ARBROATH.**—Chemists' Association (1874). Mr. James Jach, Bell Rock, Signal Tower, Arbroath.
- ASHTON-UNDER-LYNE.**—Ashton-under-Lyne and Dunkinfield Chemists' Association (1869). Mr. E. Fisher, 106, Stamford Street, Ashton-under-Lyne.
- BIRMINGHAM.**—Midland Counties Chemists' Association (1869). Mr. S. Dewson, 90, New Street, Birmingham. Chemists' Assistants' Association (1868), Birmingham.
- BRADFORD.**—Chemists' Association (1869). Mr. H. G. Rogerson, Bradford.
- BRIGHTON.**—Association of Pharmacy (1861). Mr. Marshall Leigh, 46, Dyke Road, Brighton.
- BRISTOL.**—Pharmaceutical Association (re-established 1869). G. F. Schacht, F.C.S., 7, Regent Street, Clifton, Bristol.
- COLCHESTER.**—Association of Chemists and Druggists (1845). Mr. W. B. Cordley, Colchester.
- COVENTRY.**—Coventry and Warwickshire Pharmaceutical Association (1877). F. J. Barrett, F.C.S., 75, Hertford Street, Coventry.
- DOVER.**—Chemists' Association. Mr. J. Wilford.
- DUNDEE.**—Chemists and Druggists' Association (1868). J. Russell, Dundee.
- EDINBURGH.**—Chemists' Assistants' Association. Mr. J. R. Hill.
- EXETER.**—Exeter Pharmaceutical Society (1845). G. Pasmore, Exeter.
- GLASGOW.**—Chemists and Druggists' Association (1854). Mr. John C. Hunter, 99, Great Western Road, Glasgow.
- HALIFAX.**—Halifax and District Chemists and Druggists' Association (1868). Mr. W. C. Hebden, 64, North Gate, Halifax.
- HULL.**—Chemists' Association (1868). Mr. C. B. Bell, 6, Spring Bank, Hull.
- LEEDS.**—Chemists' Association (1862). Mr. J. Hellowell, 88, West Street, Leeds.
- LEICESTER.**—Chemists' Assistants and Apprentices' Association (1869). Mr. S. F. Burford, Leicester.
- LINCOLN.**—Chemists' Association. Mr. C. F. Gadd, 200, High Street, Lincoln.
- LIVERPOOL.**—Chemists' Association (1868). T. Williams, F.C.S., Royal Institution, Colquitt Street, Liverpool.
- LONDON.**—Chemists' Assistants' Association. Mr. C. Parkinson, 225, Oxford Street, W.
- MANCHESTER.**—Chemists and Druggists' Association (1853). F. B. Benger, F.C.S., 7, Exchange Street, Manchester.
- NORTHAMPTON.**—Pharmaceutical Association (1871). Mr. F. A. Ashton, 6, Regent Square, Northampton.
- NOTTINGHAM.**—Nottingham and Notts Chemists' Association (1863). Mr. C. W. Warriner, 135, Union Road, Nottingham.
- OLDHAM.**—Chemists' Assistants and Apprentices' Association (1870). Mr. J. Naylor, Oldham.
- PLYMOUTH.**—Association of Chemists for Plymouth, Devonport, and Stonehouse (1868). Mr. G. Breeze, Catherine Street, Devonport.
- PRESTON.**—Pharmaceutical Students' Society. Mr. H. Denham, 8, Regent Street, Preston.
- ROCHDALE.**—Chemists' Association.
- SCARBOROUGH.**—Chemists' Association (1870). J. Whitfield, F.C.S., Scarborough.
- SHEFFIELD.**—Pharmaceutical and Chemical Society (1869). Mr. G. T. W. News-holme, 74, Market Place, Sheffield.
- SUNDERLAND.**—Chemists' Association (1869). Mr. C. Rankin, Sunderland.
- TAUNTON.**—Chemists' Association (1870). Mr. H. Prince, Fore Street, Taunton.
- WOLVERHAMPTON.**—Chemists and Druggists' Association (1874). Mr. W. Y. Brevitt, Darlington Street, Wolverhampton.
- YORK.**—Chemists' Association (1865). Mr. Saml. Scruton, 13, Micklegate, York.

PRESENTATION COPIES OF THE YEAR-BOOK OF PHARMACY ARE
FORWARDED TO THE FOLLOWING :—

The Honorary Members.

Libraries.

American Pharmaceutical Association; Chemical Society of London; Ecole de Pharmacie, Montpellier; Massachusetts College of Pharmacy; North British Branch of the Pharmaceutical Society; Pharmaceutical Society of Great Britain; Pharmaceutical Society of Ireland; Pharmaceutical Society of New South Wales; Pharmaceutical Society of Toronto; Royal Society of London; Société de Pharmacie, Paris; Yorkshire College of Science.

Provincial Associations (having Libraries).

Aberdeen Society of Chemists and Druggists; Arbroath Chemists' Association; Brighton Chemists' Association; Bristol Pharmaceutical Association; Colchester Association of Chemists and Druggists; Coventry and Warwickshire Pharmaceutical Association; Exeter Pharmaceutical Society; Glasgow Chemists and Druggists' Association; Halifax and District Chemists and Druggists' Association; Hull Chemists' Association; Leeds Chemists' Association; Leicester Chemists' Assistants and Apprentices' Association; Liverpool Chemists' Association; Manchester Chemists and Druggists' Association; Midland Counties Chemists' Association; Northampton Pharmaceutical Association; Nottingham and Notts Chemists' Association; Oldham Chemists and Druggists' Assistants and Apprentices' Association; Sheffield Pharmaceutical and Chemical Association; Sunderland Chemists' Association; Wolverhampton Chemists and Druggists' Association; York Chemists' Association.

Journals.

American Journal of Pharmacy; Archiv der Pharmacie; British Medical Journal; Canadian Pharmaceutical Journal; Chemical News; Chemist and Druggist; Journal de Pharmacie d'Anvers; Journal de Pharmacie et de Chimie; Lancet; Medical Press and Circular; Medical Times and Gazette; New Remedies; Pharmaceutical Journal; Pharmaceutische Centralhalle; Pharmacist; Répertoire de Pharmacie; Revista Farmaceutica.

THE FOLLOWING JOURNALS ARE RECEIVED FROM THEIR RESPECTIVE EDITORS :—

American Journal of Pharmacy; Archiv der Pharmacie; British Medical Journal; Canadian Pharmaceutical Journal; Chemical News; Chemist and Druggist; Journal de Pharmacie d'Anvers; Journal de Pharmacie et de Chimie; New Remedies; Pharmaceutical Journal; Pharmaceutische Centralhalle; Pharmacist; Proceedings of the American Pharmaceutical Association; Répertoire de Pharmacie; Revista Farmaceutica.

PROGRAMME OF THE PROCEEDINGS

OF THE

BRITISH PHARMACEUTICAL CONFERENCE

AT THE

EIGHTEENTH ANNUAL MEETING, YORK, 1881.

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(Who have filled the office of President).

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THOMPSON, Mr. W. M., York.
THOMPSON, Mr. T., Jun., Richmond.
WALTON, Mr., Jun., Richmond.
YOUNG, Mr., York.

THE SITTINGS OF THE CONFERENCE WERE HELD IN THE
MERCHANTS' HALL, FOSSGATE, YORK.

ON TUESDAY AND WEDNESDAY, THE 30TH AND 31ST AUGUST, 1881.

Commencing at Half-past Ten a.m. each day.

MONDAY, 29th AUGUST.

The EXECUTIVE COMMITTEE met, according to notices from the Secretaries, at 8 p.m., at the Station Hotel.

TUESDAY, 30th AUGUST.

The CONFERENCE met at 10.30 o'clock, a.m., adjourning at 1 p.m.; and at 2.30 o'clock p.m., adjourning at 5 p.m.

Order of Business.

Reception of Delegates.
Report of Executive Committee.
Financial Statement.
Report of Treasurer of the "Bell and Hills" Library Fund.
President's Address.
Reading of Papers and Discussions thereon.

PAPERS.

1. *Report on the Essential Oil of Ginger.* By J. C. THRESH, B.Sc., F.C.S.
 2. *Further Observations on Glycelæum.* By T. B. GROVES, F.C.S.
 3. *Notes on the Presence of Codeia and Narceia in the English Poppy Capsule.*
By T. B. GROVES, F.C.S.
 4. *The Estimation of Iodide of Iron.* By W. A. H. NAYLOR and D. HOOPER.
 5. *On the Proximate Principles of Henbane.* By E. MERCK, Darmstadt.
 6. *On the Pharmacopœia Test for Pepsin.* By F. BADEN BENGEB, F.C.S.
 7. *Copying Ink for readily transcribing Letters without a Press.* By Professor
ATTFIELD, F.R.S., etc.
 8. *Note on the Estimation of Nitrites in Potable Water.* By C. EMIN, F.C.S.
 9. *Note on the Solubility of Carbonic Anhydride in Certain Aromatic Waters.*
By C. H. BOTHAMLEY.
 10. *Note on Oxide of Zinc.* By R. F. REYNOLDS.
 11. *Note on Sulphate of Beberia.* By D. B. DOTT.
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Between 1 and 2.30, that is to say, during the mid-day adjournment, all members attending the meeting, on invitation of the Local Committee, partook of a Luncheon served in the Ante-Room.

WEDNESDAY, 31st AUGUST.

The EXECUTIVE COMMITTEE met at 10 a.m.

The CONFERENCE met at 10.30 o'clock a.m., adjourning from 1 p.m. till 2.30 p.m. The whole of the business of the Conference was completed this day by about 5 p.m.

Order of Business.

Reception of Delegates.

Reading of Papers and Discussions thereon.

PAPERS.

12. *Note on some Samples of Jamaica Grown Jalap.* By THOMAS GREENISH, F.C.S.
13. *Note on the Alleged Presence of Nicotine in Indian Hemp.* By L. SIEBOLD, F.C.S., F.I.C., and T. BRADBURY.
14. *Note on the Detection of Salicylic Acid in Urine in Ordinary and Special Cases.* By L. SIEBOLD, F.C.S., F.I.C., and T. BRADBURY.
15. *Note on Glycerinum Acidi Gallici.* By Professor T. E. THORPE, Ph.D., F.R.S.
16. *On Commercial Specimens of Hydrobromic Acid.* By J. C. THRESH, B.Sc., F.C.S., and R. WRIGHT.
17. *On Hydrobromic Acid.* By F. W. FLETCHER, F.C.S.
18. *Note on Paraffin Oil.* By C. SYMES, Ph.D.
19. *Further Notes on Shale and Petroleum Products.* By ALFRED H. ALLEN, F.C.S.
20. *An Improved Process for the Extraction of Atropine.* By A. W. GERRARD, F.C.S.
21. *Preliminary Report on the Atropine Value of Cultivated and Wild Belladonna.* By A. W. GERRARD, F.C.S.
22. *On Red Bark.* By J. E. HOWARD, F.R.S.
23. *Which kinds of Cinchona Bark should be used in Pharmacy?* By E. M. HOLMES, F.L.S.
24. *Remarks on the Relative Advantages of Indian and South American Barks for Pharmaceutical Purposes.* By W. DE NEUVILLE.
25. *Notes on the Crystallization of Orthophosphoric Acid.* By H. P. COOPER, F.C.S.
26. *Results of Experiments made upon the Barks of Cinnamon and Cassia, and upon the Oils extracted therefrom.* By J. WOODLAND, F.L.S., F.C.S.
27. *Investigations on Succus Glycyrrhizæ, particularly as regards the Amount of Gum contained in it.* By H. P. MADSEN, Vice-President of the Danish Society of Apothecaries.

Place of Meeting for 1882.

Election of Officers for 1881-82.

Between 1 and 2.30, that is to say, during the mid-day adjournment, all members attending the meeting were invited by the Local Committee to partake of a Luncheon, served in the Ante-Room.

The Year-Book Committee met at 2 p.m.

THURSDAY, 1st SEPTEMBER.

Most of the Members attending the York Meeting, accompanied by the Local Committee, went for a very pleasant Excursion to Studley Royal and Fountains Abbey.

BRITISH PHARMACEUTICAL CONFERENCE.

MEETING AT YORK, 1881.

THE Eighteenth Annual Meeting of the British Pharmaceutical Conference commenced on Tuesday, August 30th, at the Merchants' Hall, York, under the presidency of R. Reynolds, Esq., F.C.S., of Leeds.

The following members and visitors were present during the meetings :—

- Ashton-under-Lyne.*—William Bostock.
Barnsley.—T. Lister.
Barnstaple.—W. Symons.
Bath.—P. Braham, R. D. Commans, C. Ekin.
Belfast.—J. C. C. Payne.
Birmingham.—W. A. Tilden, D.Sc.
Boston Spa.—M. Rogerson.
Bradford.—T. Pullan.
Brighton.—W. D. Savage, W. G. Savage.
Buxton.—J. C. Thresh.
Cheltenham.—W. Barron.
Chertsey.—J. Boyce.
Clifton.—G. F. Schacht, W. A. Shenstone.
Dalmuir (N.B.).—E. C. C. Stanford.
Darlington.—J. Robinson.
Doncaster.—J. T. Haselby, M. H. Stiles.
Driffeld.—L. B. Ross.
Droitwich.—W. H. Hunting, E. Taylor.
Dublin.—C. R. Tichborne, Ph.D.
Edinburgh.—G. H. Laird, J. Mackenzie, T. Symington, J. R. Young.
Fence Houses (Durham).—F. W. Hunter.
Gateshead.—H. B. Brady.
Glasgow.—D. Frazer, A. Kinninmont, J. Nicol.
Harrogate.—J. Coupland, J. H. Wilson.

Huddersfield.—J. Jarman.

Hull.—J. Baynes, jun., C. B. Bell, W. H. Hammond, C. L. Metcalfe, R. M. Stoakes.

Kilmarnock.—J. Borland.

Leeds.—C. H. Bothamley, W. K. Ferguson, J. Hellowell, H. Pocklington, R. Reynolds, R. F. Reynolds, C. W. Smeeton, Wm. Smeeton, S. Taylor, G. Ward, E. Yewdall.

Leamington.—W. H. Pullin.

Leicester.—J. W. Clark, J. G. F. Richardson.

Liverpool.—A. C. Abraham, M. Conroy, E. Davies, A. H. Mason, R. Sumner, C. Symes, Ph.D.

London.—F. Andrews, H. E. Armstrong, Ph.D., J. Attfield, Ph.D., F. Braby, R. Bremridge, S. M. Burroughs, M. Carteighe, E. L. Cleaver, C. R. Drysdale, M.D., F. W. Fletcher, A. W. Gerrard, H. Gillman, T. Greenish, W. Hills, A. Hodgson, A. B. Lewinton, W. Martindale, J. K. Matterson, W. A. H. Naylor, F. Pasmore, B. H. Paul, Ph.D., E. Pettinger, S. Plowman, P. Princep, J. Robbins, J. Robinson, R. A. Robinson, A. Sangster, S. L. Stacey, W. H. Symons, G. S. Taylor, H. S. Wellcome, J. Williams, M. W. Williams, A. C. Wootton, F. Wrentmore, C. R. A. Wright, D.Sc., T. R. Wright.

Matton.—J. Buckle.

Manchester.—F. B. Bengier, T. Bradbury, L. Siebold.

Newcastle-on-Tyne.—N. H. Martin, B. S. Proctor.

Newcastle, Staffs.—E. H. Croydon.

Preston.—J. G. P. Simpson.

Ripon.—J. B. Parkin.

Rochdale.—J. Booth.

Scarborough.—H. Chapman, J. Whitfield.

Selby.—T. J. Cutting.

Settle.—J. W. Shepherd.

Sheffield.—A. H. Allen, G. Ellinor, G. T. W. Newsholme, W. Ward.

Shepton Mallet.—G. J. Cottrill.

Sherburn.—J. Dove.

Southampton.—R. Chipperfield.

St. Ives (Hunts).—H. Barton.

Swansea.—N. M. Grose, J. Hughes.

Tadcaster.—P. Howell.

Torquay.—H. Hearder, W. Hearder.

Wakefield.—J. L. Chaplin.

West Hartlepool.—J. M. McBeath.

Weymouth.—T. B. Groves.

Wigan.—J. Phillips.

Wokingham.—J. G. Barford.

York.—T. Batty, J. R. Blanshard, E. Carter, J. Clark, F. Collins, R. Cummings, R. Davison, R. Dresser, I. T. Furniss, W. T. Hey, T. W. Hodges, W. Hood, M.R.C.S., F. Leak, W. Lund, G. F. Lupton, J. A. Lupton, W. McKay, R. H. Oakley, T. B. Oglesby, H. J. Pratt, J. T. Purdy, T. J. Russell, J. Saville, S. Scruton, W. C. Sellé, F. Slinger, W. Slinger, J. Sowray, H. Terry, L. J. Thompson, W. M. Thompson, T. Wand, and J. Young.

MEETINGS OF THE EXECUTIVE COMMITTEE.

The Executive Committee met on Monday evening, August 29th, and on Wednesday morning, August 31st.

There were present on Monday: Mr. R. Reynolds, president; Messrs. Brady, Groves, Schacht, Attfield, Davison, and Grose, vice-presidents; Mr. Ekin, treasurer; Messrs. Benger and Carteghe, hon. gen. secs.; Messrs. Dresser, Hughes, Mason, Plowman, Sowray, Thresh, and Young.

The minutes of the previous meeting were read and confirmed.

A draft report of the Executive Committee for presentation at the meeting was submitted by the honorary secretaries, and after some alterations and additions was approved. The Treasurer's financial statement was received and adopted.

Applications from Societies at Boston (U.S.A.), Northampton, and York, for copies of the *Year-Book of Pharmacy*, were read and acceded to.

A letter was read from Mr. Henry Greenish, explaining his temporary inability to present his report on the principles of Nerium Oleander, on account of the difficulty he had experienced in obtaining the material.

The papers offered to be read at the Annual Meeting were considered and the programme was arranged.

A number of gentlemen were elected members of the Conference.

At the Meeting on Wednesday, there were present: Mr. R. Reynolds, president; Messrs. Brady, Groves, Schacht, and Attfield, vice-presidents; Mr. Ekin, treasurer; Messrs. Benger and Carteghe, hon. gen. secs.; Messrs. Dresser, Greenish, Plowman, and Symes.

The minutes of the previous meeting were read and confirmed.

A discussion arose as to whether the Committee should or should not suggest a list of officers to the Annual Meeting for election, and after consideration it was decided to do so, following the example of most of the learned societies.

A list of proposed officers was then agreed to, and the Committee adjourned.

GENERAL MEETING.

Tuesday, August 30th.

At the commencement of the proceedings Mr. R. DAVISON, Chairman of the Local Committee, said it was his pleasant duty, on behalf of the chemists of York, to accord a cordial and fraternal greeting to the members of the British Pharmaceutical Conference. He could assure them that the Local Committee would use every exertion to make this visit to their good old city as pleasant and attractive as possible. Chemists in York could not boast of being a very wealthy body, and if they should somewhat fail in that lavish hospitality which the Conference had received in more wealthy towns, they were anxious to make up any deficiency in that respect by the cordiality of the welcome offered to their brethren, so that it was hoped that they would all return home with pleasant recollections of the few days they had spent in the ancient city of York. In it would be found much to please. There were some evidences of modern progress and of engineering enterprise; but York was essentially a city of the past, and abounded in landmarks of bygone ages,—in relics of a feudal power and of ecclesiastical grandeur,—and in wandering through the quaint old streets of York, most of their visitors would find something very different from what they had seen elsewhere.

Mr. F. BENDER (Secretary) then read the following—

LIST OF DELEGATES.

From the *Pharmaceutical Society of Great Britain*.—Thomas Greenish (President), G. F. Schacht, F.C.S. (Vice-President), Messrs. M. Carteighe, F.I.C., F.C.S., D. Fraser, W. Hills, F.C.S., F.R.M.S., Richardson, J. Robbins, F.C.S., W. D. Savage, C. Symes, Ph.D., J. Williams, F.C.S., J. R. Young.

From the *North British Branch of the Pharmaceutical Society*.—Messrs. J. R. Young, G. H. Laird, and James Mackenzie, Edinburgh; Messrs. A. Kinninmont, D. Fraser, and J. Nicol, Glasgow; Mr. Borland, Kilmarnock.

From the *Pharmaceutical Society of Ireland*.—Messrs. C. R. C. Tichborne, LL.D. (President); J. C. C. Payne, Belfast.

From the *Brighton Association of Pharmacy*.—Mr. W. D. Savage.

From the *Bristol Pharmaceutical Association*.—Mr. G. F. Schacht (President).

From the *Glasgow Chemists and Druggists' Association*.—Messrs. Alexander Kinninmont and E. C. C. Stanford.

From the *Hull Chemists' Association*.—Messrs. C. M. Bell, B. M. Stoakes, and W. H. Hammond.

From the *Leeds Chemists' Association*.—Messrs. E. Yewdall (Vice-President), Hellowell (Hon. Sec.), G. Ward, F.C.S., and S. Taylor.

From the *Leicester Chemists' Assistants and Apprentices' Association*.—Messrs. J. G. F. Richardson and J. W. Clark.

From the *Liverpool Chemists' Association*.—Messrs. A. H. Mason, F.C.S., C. Symes, Ph.D., R. M. Sumner, and Michael Conroy, F.C.S.

From the *Manchester Chemists and Druggists' Association*.—Messrs. F. B. Bengier, F.C.S. (Hon. Sec.), and Louis Siebold, F.I.C., F.C.S.

From the *Southampton Society*.—Mr. Chipperfield.

From the *Sheffield Pharmaceutical and Chemical Society*.—Messrs. G. Ellinor (President) and G. T. W. Newsholme.

Mr. CARTEIGHE then read the report of the Executive Committee, as follows :—

EIGHTEENTH REPORT OF THE EXECUTIVE COMMITTEE.

Your Committee have held several meetings in London since the last meeting of the Conference, both for the purpose of electing new members, and for arranging the details of administration rendered necessary by the retirement of Professor Attfield, F.R.S., from the office of Senior Honorary Secretary.

Financial arrangements resulting from this change have been the subject of much consideration, the outcome of which is that the Treasurer has undertaken the sole charge of the finances of the Conference, and has opened an account at the Bloomsbury Branch of the London and Westminster Bank in the name of the Conference. Moneys are paid into that account, and cheques are drawn against it by the Treasurer.

Your Committee report with pleasure that several applications for grants in aid of research have been made, and some others which did not fall within the lines on which grants are voted could not be entertained. The Committee, however, hope that members

will not fail to avail themselves of these aids to research, and undertake investigations which will confer honour on the Conference, and do credit to the individual worker. The sum of £10 has been placed at the disposal of Mr. H. G. Greenish for an investigation of the principles of *Nerium Oleander*, and a like sum was voted to Mr. Gerrard to enable him to determine the relative activity of the various parts of the belladonna plant, and the difference in activity between the wild and cultivated varieties of that plant.

At a meeting held in December the following letter was received from the Assistant Secretary, Dr. Senier:—

“Laboratory of the Pharmaceutical Society,
“17, Bloomsbury Square.

“To the Executive Committee of the British Pharmaceutical Conference.

“Gentlemen,—I hereby tender my resignation as Assistant Secretary, and hope that you may be able to arrange that I be relieved of the duties of that position at an early date.

“The reasons which induce me to take this step are, that the duties of the Assistant Secretaryship, which have long pressed heavily on my time not engaged in school work, and which have of late necessarily increased, are now quite incompatible with the position I hold as Demonstrator in this school.

“I am, Gentlemen,

“Sincerely yours,

“A. SENIER.”

It was resolved that Dr. Senier's resignation be accepted, and a sub-committee was appointed to take the necessary steps for obtaining the services of a paid Secretary, and to consider the duties of the new officer. At a subsequent meeting of the executive committee, this sub-committee reported that they had received twenty-five applications in response to advertisements in the *Pharmaceutical Journal*, *Chemist and Druggist*, *Nature*, and *Chemical News*. Of these they recommended three as being eligible for the post. A ballot having been taken, Mr. Philip Princep was appointed Secretary for the current year on the following conditions:—(1) Salary to be £100 per annum. (2) Three months' notice on either side to terminate the engagement. (3) Expenses of Secretary to annual meetings to be defrayed by the Conference. (4) Guarantee for £100 to be provided; the annual premium to be paid by the Conference.

One of the Honorary Secretaries was instructed to write a letter to Dr. Senier expressing the appreciation by the Committee of the services he had rendered, and their regret at losing the benefit of his past experience in the working of the affairs of the Conference.

The *Year-Book* Committee and the Editor have had under their consideration the quality and suitability of the paper, printing, and binding of the annual volumes; also, the matter and transactions, and the propriety of continuing to receive advertisements. The printing and binding were regarded as satisfactory, but it was thought that somewhat more condensed abstracts might, in some cases, be desirable. It has been decided that a Bibliography, or Catalogue Raisonné, of books and papers bearing on pharmaceutical subjects should, in future, be added, and the classification of the members in cities and towns be published only occasionally; also, that the advertisements, for financial reasons, should continue to be admitted. These recommendations will be carried out, as far as practicable, in the preparation and publication of the volume for 1881. The manuscript of the *Year-Book* proper, as distinct from the Transactions, is already completed, and the first portion is in the hands of the printers. The members may, therefore, look forward to the issue of the 1881 *Year-Book* at an earlier date than in preceding years.

Your Committee has the gratification to report the receipt of the following cordial invitation to the Conference for next year:—

“Southampton, Aug. 24, 1881.

“Dear Sirs,—Understanding that the British Association intends holding its meeting for 1882 in Southampton, and knowing that it is usual for the British Pharmaceutical Conference to hold its meeting at the same time as the Association, the chemists of this town have held a meeting and agreed unanimously to invite most cordially the Conference to hold its annual meeting for next year in this town. We have selected as our delegate to represent us at your meeting Mr. Chipperfield, who will explain to you *vis à voce* the pleasure it will give us, if you will accept our invitation.

“Trusting you will accept it, and that the 1882 meeting will be one of your happiest and most pleasant,

“I am, dear Sir, Yours faithfully,

“O. R. DAWSON,

“*Hon. Secretary.*

“To the Hon. Secretaries,

“British Pharmaceutical Conference.”

This communication will be brought before the members for consideration as usual at the concluding meeting on Wednesday.

At the meeting of your Committee on Monday, August 29, the President reported that on the part of the Conference he had attended the meeting of the International Pharmaceutical Congress recently held in London, and had enjoyed the opportunity, as a Vice-President of that Congress, of appreciating the cordiality and good feeling which prevailed between the foreign and home members. That such an international meeting should prove so eminently successful affords grounds for hoping that each successive meeting of this Conference will more and more contribute to cement the bonds of fellowship between pharmacists, and materially advance the art which they practise.

The following thirty-four gentlemen have been elected members since the last Annual Meeting :—

| | |
|--------------------------------|----------------------------------|
| Abraham, Mr. A. C., Liverpool. | Laverack, Mr. W. H., Malton. |
| Bothamley, Mr. C. H., Leeds. | Lewis, Mr. T., Manchester. |
| Bradbury, Mr. T., Hyde. | Millidge, Mr. A., Newport, I. W. |
| Carter, Mr. E., York. | Ogilvie, Mr. W. O., Naini Tal. |
| Cooper, Mr. H. P., London. | Parkin, Mr., Ripon. |
| Cortis, Mr. A. B., Worthing. | Pratt, Mr. H., Warwick. |
| Emson, Mr. W. N., Dorchester. | Princep, Mr. P., London. |
| Ferguson, Mr. W. H., London. | Reynolds, Mr. R. F., Leeds. |
| Finlay, Mr. J., Holywood. | Skemsingworth, Mr. G., Pol- |
| Francis, Mr. T. H., London. | lokshields. |
| Godbier, Mr. H., Rangoon. | Smith, Mr. J., Weymouth. |
| Hall, Mr. A. L., Winchcombe. | Thompson, Mr., York. |
| Hammond, Mr. W. H., Hull. | Thompson, Mr. J. T., Richmond, |
| Herbert, Mr. G., Stockton-on- | Yorks. |
| Tees. | Vickers, Mr. T., Beverley. |
| Hunter, Mr. F. W., Fence | Walton, Mr. E. B., Richmond, |
| Houses. | Yorks. |
| Hurley, Mr. E. W., London. | Williams, Mr. J. W., London. |
| Ison, Mr. J., Wellington. | Williams, Mr. M. W., London. |
| King, Mr. H. A., Norwich. | |

M. Ekin (Treasurer) then read the following Financial Statement :—

FINANCIAL STATEMENT, 1880-81.

The Hon. Treasurer in Account with the British Pharmaceutical Conference.

| Dr. | £ | s. | d. |
|--|-------|----|----|
| To Balance in hand, July 1, 1880 | 270 | 7 | 5 |
| „ Sale of Year-Books by Publishers | 24 | 6 | 8 |
| „ „ „ Secretary | 9 | 0 | 0 |
| „ Advertisements, 1878 vol. | 0 | 12 | 0 |
| „ „ 1879 vol. | 10 | 18 | 0 |
| „ „ 1880 vol. | 98 | 1 | 0 |
| „ Subscriptions from Members | 709 | 12 | 4 |
| July. To Dividend on £250 Consols. | 8 | 13 | 4 |
| 1881. Jan. „ „ | 8 | 12 | 9 |
| | <hr/> | | |
| | £1130 | 8 | 6 |
| | <hr/> | | |

| Cr. | £ | s. | d. |
|---|-------|----|----|
| By Expenses connected with Year-Book:— | | | |
| Printing, binding, and distributing. | £455 | 18 | 0 |
| Editor's Salary | 150 | 0 | 0 |
| Publishers' Commission on Advertise- ments | 27 | 7 | 9 |
| Advertising Year-Book | 2 | 6 | 6 |
| Foreign Journals | 5 | 2 | 6 |
| | <hr/> | | |
| | 640 | 14 | 9 |
| „ Directing Circulars | 5 | 8 | 6 |
| „ Grants in aid of Research | 15 | 0 | 0 |
| „ Secretaries' Salary | 71 | 0 | 0 |
| „ Printing and Stationery | 43 | 13 | 8 |
| „ Sundry Expenses | 11 | 2 | 0 |
| „ Postage | 44 | 4 | 9 |
| „ Expenses of Swansea Meeting. | 18 | 2 | 6 |
| „ Advertising | 3 | 7 | 8 |
| „ Balance at Bank, June 30, 1881 | £279 | 2 | 2 |
| „ Cash in Secretary's hands, June 30, 1881 | 3 | 7 | 8 |
| | <hr/> | | |
| | 282 | 9 | 10 |
| | <hr/> | | |
| | £1130 | 8 | 6 |
| | <hr/> | | |

| | | | |
|--|-----|----|----|
| | £ | s. | d. |
| Assets July 1, 1881 { Cash in hand | 282 | 9 | 10 |
| { Consols (stock) | 250 | 0 | 0 |

The Bell and Hills Fund.

| Dr. | | £ | s. | d. |
|-----------------------------------|---|-----------------|----|----|
| To Balance in hand, July 1, 1880. | . | 15 | 5 | 1 |
| July. To Dividend on £350 Consols | . | 5 | 2 | 9 |
| 1881. | | | | |
| Jan. | " | 5 | 2 | 0 |
| | | <u>£25 9 10</u> | | |
| Cr. | | £ | s. | d. |
| 1881. | | | | |
| June 30. By Balance at Bank | . | 25 | 9 | 10 |
| | | <u>£25 9 10</u> | | |

| | £ | s. | d. |
|--------------------------------------|-----|----|----|
| Assets July 1, 1881 { Cash in hand . | 25 | 9 | 10 |
| { Consols (Stock) . | 350 | 0 | 0 |

Audited and found correct, { JOHN T. WILLIAMS, } Auditors.
{ JOHN CLARK, }

Mr. J. SOWRAY (York) moved the adoption of the report and balance sheet.

Mr. J. CLARK (York), in seconding the motion, bore testimony, as one of the auditors, to the admirable manner in which the accounts had been kept.

The motion was put and carried.

Mr. CARTEIGHE said, in connection with the Treasurer's report on the Bell and Hills Fund, it would be as well to inform the members that the Executive Committee had received a communication from York, and had requested him to obtain the books they had the privilege of handing over through the generosity of the donor of this fund. But unfortunately, as often happened in these cases, the local body was so anxious to select the best and most suitable books, that a decision was not arrived at until a few days ago, and as the Executive had to purchase the books, and get them bound in a suitable manner, it had been impossible to lay them on the table, as they would have liked to do. The books would, however, be sent down in a few days, and would, he hoped, form a pleasant reminiscence to the York Local Association, of the visit of the Conference.

The PRESIDENT said he might be allowed to add, what perhaps the

modesty of their local friends would not allow them to say for themselves, that this gift of books would be the commencement of a library for the York Chemists' Association, which would be open to receive any additions to it, and he was quite sure their York friends would appreciate the attention, if any visitors liked to leave a memorial behind them in the shape of a book or two. He himself had had the pleasure of bringing a copy of Flückiger and Hanbury's 'Pharmacographia,' as his own contribution.

It was stated that a letter had been received from Mr. W. Southall, F.L.S., late President, expressing his regret that he was not able to be present.

The PRESIDENT then delivered the following address:—

THE PRESIDENT'S ADDRESS.

Gentlemen, the question, "Why are we here to-day?" is capable of a direct answer. The stone thrown into water sets in motion its circle of wavelets—a series of which the continuity is undoubted. So the British Pharmaceutical Conference meets in York to-day as a direct result of what happened in this ancient and honourable city fifty years ago. On the morning of September 27th, 1831, the theatre of the Yorkshire Museum was filled by an assemblage which included many distinguished members of learned and scientific bodies in different parts of the United Kingdom, who were collected together in consequence of a general invitation to the friends of science, issued by the Yorkshire Philosophical Society. Three hundred and fifty-three tickets were applied for, and the meeting resulted in the formation of the British Association for the Advancement of Science. The leading object of the new organization was tersely defined:—"To give a stronger impulse and more systematic direction to scientific inquiry." Many who are now present will be likely to hear from some authorized mouthpiece of the British Association the full story of its early hours in this fair cradle, and the press will doubtless record the same that all may read. I will not intrude on this general ground, but will call your attention to the circumstance that, even in this stage of its existence, the British Association had amongst its then limited number of active supporters a member of our own profession of pharmacy. The earliest sub-committee for the subject of chemistry consisted of Professor Cumming, Dr. John Dalton, Dr. Daubeney, Rev. W. V. Harcourt, Professor Johnston, Professor Turner, and Mr. William West. One of the few recommendations made by this committee was "that Mr. West be requested to pursue the experiments contemplated by him, into the combination of gaseous bodies when

passed through heated tubes." At this time William West was engaged in pharmacy at Leeds, and he was a very active member and one of the honorary secretaries of the Leeds Philosophical and Literary Society. I may be pardoned for saying here that it has happened to me to succeed him in both these relations of life. Mr. West was born in London, in 1793, and he was for some years engaged in the establishment of Messrs. Allen, Hanbury & Co., Plough Court, which he left in 1816 to settle in Leeds. He preserved well the traditions of the school in which he had been trained, and enjoyed an extensive reputation as a sound analytical chemist, ultimately relinquishing the commercial side of his calling for the professional one. For several years he was a Fellow of the Royal Society.

As an illustration of the tendency to excite new movements which belongs to each such step, the President of the meeting at York, Viscount Milton, gave the first place in his argument to the circumstance that "similar meetings had taken place on the continent of Europe, which have been attended by the most beneficial effects." The report of the meeting of the new Association occupied but little space in the local newspapers of the period, which were then small weekly prints. In the next Annual Report of the Leeds Philosophical and Literary Society, the event is alluded to as follows:—"And as a parting subject of congratulation, the Council would call your attention to the British Association for the Advancement of Science, a society which was formed shortly before the commencement of our session, under the most favourable auspices, and which, from the facilities afforded by its constitution, will for all practical purposes unite the various local institutions into one vigorous and luxuriant whole,—

'Branching so broad along, that in the ground
The bending twigs take root, and daughters grow
About the mother tree.'

These lines, adopted by Mr. West, have, for members of the British Pharmaceutical Conference, a savour of prophecy.

Let us glance at the state of pharmacy at this period. We may recollect that the coronation of King William IV. had just occurred, that Lord Brougham was the most prominent of public men in Yorkshire, and that the opening of the Liverpool and Manchester Railway had happened within a year.

The London Pharmacopœia of 1824 was then the guide for the chemists and druggists of England, and it is interesting to study in

a tabular form a synoptic list of its preparations, comparing some of the groups with those corresponding to them in earlier and later pharmacopœias, and observing in what direction changes have been made.

| | P.L. 1659 | P.L. 1677 | P.L. 1788 | P.L. 1824 | P.L. 1836 | B.P. 1867 |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Acids | — | — | 6 | 8 | 11 | 22 |
| Waters | — | — | 9 | 10 | 28 | 13 |
| Ointments and Cerates | 52 | 28 | 22 | 24 | 33 | 34 |
| Confections and Electuaries | 24 | 18 | 13 | 11 | 11 | 8 |
| Decoctions | — | — | 10 | 15 | 23 | 14 |
| Plasters | 38 | 47 | 13 | 12 | 12 | 14 |
| Extracts and Liquid Extracts | — | — | 14 | 23 | 28 | 36 |
| Infusions | — | — | 4 | 18 | 24 | 28 |
| Iron: preparations of | — | — | 4 | 4 | 5 | 14 |
| Honey | — | — | 3 | 3 | 2 | 2 |
| Liniments | — | — | 3 | 8 | 9 | 16 |
| Liquors | — | — | 12 | 14 | 16 | 37 |
| Mercury: preparations of | — | — | 11 | 9 | 12 | 8 |
| Mixtures | — | — | 3 | — | 12 | 11 |
| Oils | — | — | 23 | 18 | 15 | 80 |
| Oxymels | — | — | 4 | 2 | 2 | 2 |
| Pills | 36 | 30 | 6 | 9 | 15 | 20 |
| Potassium: preparations of | — | — | 8 | 9 | 11 | 14 |
| Powders (compound) | — | — | 19 | 12 | 10 | 13 |
| Sodium: preparations of | — | — | 3 | 5 | 5 | 11 |
| Spirits | — | — | 20 | 23 | 17 | 15 |
| Syrups | — | — | 15 | 14 | 14 | 17 |
| Tinctures | — | — | 36 | 40 | 48 | 65 |
| Wines | — | — | 6 | 7 | 6 | 10 |
| Miscellaneous | — | — | — | — | — | — |
| | | | 267 | 307 | 369 | 454 |

The table shows a small increase in the number of preparations included in the Pharmacopœia of 1824, as compared with its predecessor of 1788. If we take those which are readily thrown into groups, the comparison stands as 307 in 1824 against 267 in 1788. The increase occurred chiefly in the groups of Decoctions (from 10 to 15); Extracts (from 14 to 23); and especially Infusions (from 4 to 18).

Our own generation would fix its attention chiefly on the remedies that were conspicuous for their absence, as quinine, morphia, and iodide and bromide of potassium. These were about to appear on the scene, for the London Pharmacopœia of 1836 contained disulphate of quinine, acetate and hydrochlorate of morphia, strychnia, veratria, iodide and bromide of potassium. Phillips states that the two latter salts were first used in medicine by Dr.

Williams of St. Thomas's Hospital, and he quotes the dose of bromide of potassium as from 3 to 10 grains.

Again referring to the table, let us fall back from 1788 to 1677, passing over the London Pharmacopœias of 1721 and 1746, which appeared in the interval. I will only trouble you by pointing out a few of the larger groups. Ointments, electuaries, and pills were more numerous than in the pharmacopœias of the eighteenth century, but the grand idea of 1677 seems to have been plasters. Our predecessors may be grouped somewhat after the fashion of the anthropologists, when they classify primitive men according to their weapons, as those of the stone, bronze, or the iron period. These seventeenth century apothecaries, judged by their weapons, were emphatically men of plasters, for their pharmacopœia had forty-seven formulæ for these preparations. Nevertheless this period was not one of utter darkness, though its light was but that of the dawn. The institution of the Royal Society, in 1660, marked the commencement of a new epoch in the intellectual life of England. Its secretary, Hooke, made great improvements in the microscope and telescope; John Ray had already published a second edition of a flora of England, and had laid a foundation for the science of zoology; and, greatest of all, Newton was on the eve of announcing his new theory of the universe. In the department of medicine, Sydenham had shown how to conduct diagnosis by a careful observation of facts, and he had vastly improved the treatment of fever and some other diseases. The chemists were now contributing to medicine their quota of remedies having a mineral origin, of which antimony made the greatest noise in the world, although it was but a restoration of a remedy used a century before, and then discarded from the dangerous effects that attended its use.

The London Pharmacopœia of 1677 gives us a picture of the materia medica when Charles II. was king and defender of the faith. Polypharmacy flourished with a brave show. The doctrine that every herb was given to man for the purpose of either food or physic was here exemplified. Thirty or forty ingredients were thought necessary to some of the most trivial preparations. In the London Pharmacopœia of 1639 was a preparation named "*Antidotvs magna Matthioli adversus venena et pestem*," which contained one hundred and thirty ingredients, some of them being compounds. In this edition we find the prototype of *confectio sennæ*, then called *electuarium lenitivum*, which contained seventeen ingredients. Its present form differs in but little beyond the excision of some of these components. In the London Pharmacopœia of 1677, the

"*catalogus simplicium*" was a list of about fifteen hundred substances, of which it is almost incredible that more than two hundred were derived from animals. Since the physicians of the time of Charles II. used these things as their weapons in the combat with disease, we must conclude that their art had become more depraved than when exercised by the Saxon leech before the Norman conquest. Of that period we have an interesting record in the three volumes of *Leechdoms, Wortcunnings, etc.*, of early England, edited by the Rev. Oswald Cockayne, M.A., and published under the direction of the Master of the Rolls (1864). The most important manuscript consulted is one with coloured drawings of the plants, now in the British Museum, and which must have been a really magnificent book, until injured by fire in 1731. It contains a herbarium and a list of *medicina de quadrupedibus*. Evidence of the universal belief in wortcunning at this period is found in one of the Proverbs of Alfred—

"No wort is waxen in wood or in field
Which for ever may man's life uphold."

Certainly the idea of charms is interwoven with this fabric of early English medicine, and a potion might demand for due efficacy that the patient should drink it from a church bell, or should repeat a cabalistic formula.

But, taking remedy against remedy, those used in the latter half of the seventeenth century were more disgusting than the leechcrafts of the eleventh century, because a perverted ingenuity had increased their number. If the one dead fly had always caused the ointment of the apothecary to send forth a stinking savour, how of this time, when the dead flies outweighed the ointment! So much for six centuries of the rule of tradition, and of

"Dropping buckets into empty wells,
And growing old in drawing nothing up."

Just a century ago, in 1782, Dr. W. Black could write of the state of things now described as belonging to a past age.* He says:—"In the last century, and in part of the present, the pharmacopœia and shops, and too frequently the sick, were overloaded with syrups and distilled waters, simple and compound, with boles, conserves, and an ostentatious heap of compositions, loathsome or

* "An Historical Sketch of Medicine and Surgery," by W. Black, M.D., 1782, p. 218. It is impossible to allude to the early history of pharmacy without acknowledging the obligations of our body to Jacob Bell's "Historical Sketch of the Progress of Pharmacy in Great Britain," first published in 1842.

insignificant. The shops have, very properly, if I may be permitted a technical phrase, been purged of a considerable part of this trash. The imperial, heavenly, and alixipharmic waters, the exhilarating confections for the heart, the whets for genius, the pearl juleps, the clays, boles, dead earths, several of volatile acid spirits, and distilled oils, the bones and hoofs of some animals, Egyptian mummies, dead men's skulls powdered, and a farrago of such feculence, are all banished from the pharmacopœias."

Our generalizations from the table are simple. They are chiefly that reformed pharmacy was well-established a hundred years ago, and that the number of preparations was at low-water mark in 1788, as a consequence of this policy of reform. Gray says, in 1823, "Formerly the list of drugs kept in the shops amounted to about two thousand, or full ten times as many as at present, and the preparations were equally numerous." From 1788, a constructive policy prevailed, and the preparations of the pharmacopœia once more began to increase in number. In the edition of 1836 the same rule obtained, and the table indicates how much higher the tide had risen in 1867, when the British Pharmacopœia showed an increase of 70 per cent. in grouped preparations, as compared with 1788. We see, then, the operation of a natural law in this steady increase in the number of preparations used in medicine. The circumstance that the older medicines do not fall into disuse is a matter for congratulation in the interests of patients. The fact is sufficient evidence of their tried and proved utility. The other fact that new remedies are being added to our pharmacopœia is equally satisfactory. I do not forget our discussion at Swansea last year upon an interesting paper by Mr. Symes on "New and Unofficial Pharmaceutical Preparations," which very naturally elicited an expression of the difficulties felt by pharmacists when new remedies are prescribed without a clue to their standard of strength. The question of new remedies has at other times been discussed with what I must consider too much emphasis on its commercial bearings. The unprofitable result of dispensing new medicines not in regular demand has been made the subject of many complaints. That the discretion of each individual may put some check upon the degree of loss is evident, but it is both the duty and the interest of the pharmacist to co-operate with the physician in widening the resources of the healing art. Mr. Symes and also Professor Attfield pointed out that from the wide seed-plot of new remedies, the survival of the fittest added new weapons to our armoury: therefore, we are bound to give fair play to all during their period of

probation. It is evident that any doubts as to the dose, strength, or the formula of a new medicine passing current under any particular title must affect its chances unfavourably. Whilst writing this, a medical friend informs me of the perplexities that arise from the variations in character—such as acidity—of syrup of hypophosphite of iron, as supplied from leading houses. I endorse cordially the expression of the want of some official action in Great Britain, similar to that taken in 1878 by the Pharmaceutical Society of Paris, in the matter of new remedies. For the convenience of our body generally, I have no hesitation in saying that the *Year-Book of Pharmacy* would be the most convenient place for such information to be published, an arrangement quite consistent with its being made public more frequently by the periodical press. The Society undertaking this labour would confer an obligation on pharmacy. But it is evident that no arrangement can obviate the necessity for individual vigilance in such matters. Let us be thankful if our minds are kept fresh by moving events rather than steeped in a condition of stagnation. For those who must read only whilst they run, there is an admirable *résumé* of the results of observation, invention, and discovery in the article given by the Editor of the *Pharmaceutical Journal* under the title of “The Month.” On this subject of the introduction of new remedies, let us give a moment's consideration to the reasons for expecting numerous additions to the *materia medica*. The chief reason must be the rapid progress of organic chemistry, of which every step in advance opens up new possibilities in therapeutics. We will once more place side by side the conditions of a period near 1831 and those of 1881, this time in relation to the progress of organic chemistry. The venerated first President of the Pharmaceutical Society, William Allen, F.R.S., was for many years one of the lecturers on chemistry at Guy's Hospital. Here is the text-book used then: it belonged to my own father when a student there in 1819, and it consists of two parts, 1st, Inorganic Chemistry, occupying 126 pages; and 2nd, Organic Chemistry, occupying 10 pages.

I compare this, not with the latest work on the subject, but, for convenience, with Gmelin's “Handbook of Chemistry,” completed several years since. In this work, the inorganic section occupies 2,500 pages, a multiple of 20 upon the Guy's text-book. But organic chemistry occupies 6,000 pages, a multiple of 600.

We may put this fact before our minds by the process which Mr. Galton calls “mental imagery.” Abstracting ourselves, we will think of the map of Great Britain, and that upon its southern coast

the Roman invaders have established themselves and have commenced the operation of road-making, this being the great civilizing influence upon barbarous countries. One single mile of road is made, and that represents the extent of knowledge of organic chemistry sixty years ago. Now, since sixty years have multiplied that knowledge by 600, our road has been carried to John O'Groat's in Scotland. Manifestly any art largely dependent upon organic chemistry must experience constant increments as a consequence of the vast extension of the science.

It is impossible to refer to pharmacopœias at such length as has now been done without putting forward once more the just claims of pharmacists to hold a position of official responsibility in their construction. We know how important was the aid given by Professor Redwood to the medical committee charged with the preparation of the British Pharmacopœia; but it is due to our calling and to ourselves that we should offer to the State more direct and formal service.

As you already know, the International Pharmaceutical Congress, held in London this month, devoted itself very earnestly to the subject of the equalization for all countries alike of the strength of the more potent pharmaceutical preparations. I had the honour of attending the Congress as your representative, and of joining in the deputation to Section 15 of the International Medical Congress. The decision of both bodies was to the same effect, viz., that from each country represented there should be two physicians and two pharmacists elected, to form a commission for the purpose just named. This consensus of opinion between the departments of medicine and of pharmacy, in their international representation, justifies the expectation that British pharmacists will, in future, be recognised as fellow-workers with physicians in the construction of the State Pharmacopœia. The golden opportunity and the wisdom to use it should be now the only essentials to the achievement of this most desirable object.

We have spoken of the pharmaceutical preparations in use fifty years since. It is not without interest to notice the change in the money value of some drugs that has occurred during this period. Some old stock books, for the years between 1827 and 1831, have supplied the cost prices which were then current.

The following may be quoted :—

| | | s. | d. | |
|---------------------------|---------------|----|----|------------|
| Citric acid . . . | 18s. to | 10 | 6 | per lb. |
| Oxalic acid . . . | | 2 | 6 | " |
| Tartaric acid . . . | | 2 | 9 | " |
| Camphor . . . | | 2 | 10 | " |
| Calomel . . . | | 4 | 3 | " |
| Calamba root . . . | | 5 | 0 | " |
| Gentian root . . . | | 1 | 0 | " |
| Castor oil . . . | 8s. (1827) to | 1 | 8 | " (1831). |
| Cantharides . . . | | 10 | 0 | " |
| Powdered nux vomica . . . | | 4 | 0 | " |
| Chia turpentine . . . | | 4 | 8 | " |
| Sarsaparilla, cut . . . | | 5 | 0 | " |
| Ergot of rye . . . | | 3 | 0 | per oz. |
| Seidlitz powders . . . | sell | 4 | 6 | per box. |
| White demy paper . . . | | 20 | 0 | per ream. |
| Draught phials . . . | | 18 | 0 | per gross. |
| Flint Glass . . . | | 2 | 0 | per lb. |

About this time Gray wrote of ergot of rye: "It has lately been attempted to be introduced into regular practice in this country, but the difficulty of obtaining it impeded its becoming fashionable, before it had palled upon the ear." *

The items concluding our list tell a story in political economy that may not be familiar to our younger members. The taxes on knowledge had not been removed in 1831, and paper came in for a heavy excise impost. Flint glass was also the subject of a crushing excise duty, until Sir Robert Peel swept away that and some hundreds of other checks on the industrial arts.

Patent medicines did not occupy so large a place in stock books as they have done in the second half of the enlightened nineteenth century. The names of a few of the proprietary medicines of our own day flourished then, but from the stock books that have come under my observation, it would seem that four-fifths of the quack medicines patronized by the last generation have now fallen into disuse.

Gentlemen, he who undertakes the task of reviewing the past, must recall events that will revive recent sorrow. Since we last met, our ranks have lost some of our foremost men. In the early years of this century, when a condition of foreign war was unhappily chronic to our country, it was the practice on receiving news of an engagement, first to toll the bells for those by whose death it had been won, before they were rung in honour of the victory. So we will proceed no further until we have paid our

* "Elements of Pharmacy," p. 279.

tribute to the memories of John Abraham, Henry C. Baildon and John Mackay. They were of the men who are the very salt of their profession. How well many of us remember the manly presence of John Abraham, of Liverpool, and the many-sided activity of his mind, serving pharmacy by various offices performed for our national or local associations, and finding time for multifarious engagements in the promotion of philanthropic, political, municipal, and scientific objects. His independence of mind might lead him to conclusions which were not always those of the majority, but all recognised in him the thinker and worker, who acted up to his high standard of a blameless life. Upon Edinburgh the blow fell heavily in the removal at a brief interval of two such citizens as Henry C. Baildon and John Mackay. Mr. Baildon was the eldest of the three of whom we now speak, and carried on business for the long period of fifty years. When this Conference visited Edinburgh in 1871, Mr. Baildon was President of the North British Branch of the Pharmaceutical Society, having been elected in order to do honour to the occasion. How well he fulfilled those expectations is reported by all who took part in the meeting of that year. His quiet disposition and thoughtful mind found recreation in the direction of invention. He introduced a most ingenious and beautiful method of "nature printing," for ferns and other plants, and secured patents for important improvements in relation to bankers' drafts. The name of John Mackay is that of a representative man, a leader, not of a district only, but of all the influence that pharmacy commands in Scotland. Of this influence, and it is not small, Mr. Mackay was for many years the animating and guiding spirit. He combined several qualities of character, which gave him this commanding power: his business capacity and habits were unsurpassed; his insight amongst specious and complicated questions was of the clearest; and he had a gift of earnest speech which made his opinion tell in the weightiest manner. It has been truly said "that he possessed a full share of the 'perfervidum ingenium' of the true Scot, yet was always the refined and courteous gentleman."

These have joined the majority, having used well their opportunities for serving their generation, and the Conference will preserve their memories, as it does those of Henry Deane, Daniel Hanbury, and William Walter Stoddart.

From a consideration of the past, let us turn to the things of to-day. The present time tinges our thoughts and feelings, often unduly, and the condition of pharmacists may be described at this

moment as being chilled by clouds. "Who will show us any good?" is a query upon many lips. We have involuntarily applied to ourselves the lines of "Hudibras":—

"Some have been cudgelled till they know
What wood the cudgel's of by the blow;
Some have been kicked till they know whether
A shoe's of neat's or Spanish leather."

And when this condition became intolerable, we felt what Dr. Johnson described when he said "that even if he were certain to be acquitted, a man would not care to be tried for his life once a week." Fortunately, there were practical men amongst us who determined that if one guardian did not suffice to protect the exercise of our lawful avocations, then we should be safe on both the right hand and the left, a condition which some other citizens of a part of the United Kingdom have adopted more ostentatiously.

The result of our action in 1876 is best described in the words of the last annual report of the Chemists and Druggists' Trade Association of Great Britain. The Executive refer to a prosecution under the Sale of Food and Drugs Act, which was successfully defended, and add, "This is the only case under the Act which the Association has been called upon to defend during the past year, and your Committee congratulates the trade on the significant fact that prosecutions against chemists and druggists for the sale of adulterated drugs are becoming year by year more rare. It will be within the recollection of the members that before the Association came into existence such prosecutions were of very frequent occurrence." This testimony to the good repute of chemists and druggists reminds me of one of the charming minor poems of George Eliot, who thus describes the Florentine drug merchant:—

"He kept an honest fame,
And had the virtue not to try and sell
Drugs that had none."

If the object of medicine is to combat the attacks of disease and prolong the limit of human life, there is some satisfaction for everyone connected with this beneficent art in the grand fact brought out by the census of 1881, that three hundred thousand lives have been saved in ten years that would have been lost had the death-rate continued at the figure of the previous decennial period. Therapeutics and preventive medicine, or sanitation, may claim to have contributed largely to so happy a result.

One of the most interesting of our unsolved problems is, How are

future pharmacists to get their technical education? At a time when technical education has become a prominent national question in relation to the larger industries of the country, and there are some early signs of its being adopted by the State, we may be sure that our body cannot safely lag behind in the race. It seems to me that the last few years have done much to make our course clearer. The subject which must receive the largest share of attention from our students is undoubtedly that of chemistry, and it is matter for hearty congratulation that the facilities for high-class teaching in this subject have multiplied many times in the provinces within the last ten years. Whilst acknowledging gratefully the services rendered by numerous teachers, who conduct evening classes at mechanics' institutes, and the like, I know that some of these would be among the first to say to young men that they cannot do justice to the science which is the foundation of their calling, if only devoting to it the fag-ends of days spent in toil. They would advise, as I do most earnestly, that all who can do it should avail themselves of the advanced instruction now provided in our chief towns, where laboratories are open the whole day. The centres of large population outside London already provided with these facilities are Edinburgh (the University and other laboratories), Glasgow (the University and Anderson's University), Manchester (Owens College), Birmingham (The Mason Science College), Leeds (the Yorkshire College), Newcastle-on-Tyne (the College of Physical Science), Bristol (University College), Nottingham (University College), and Sheffield (Firth College); whilst Liverpool will soon be ready with its liberally endowed University College.

As bearing upon this subject, let me call your attention to the attendance of candidates for the Preliminary examination at the various centres. An aggregate attendance of 3,621 candidates is recorded for Great Britain at eleven examinations. Now the eleven towns just named, with London, entered 1,995 of those candidates, being 55 per cent. of the whole. It is certain that a considerable proportion of this number reside so near the centres which they selected for their preliminary examinations, that they could conveniently attend classes held in those towns. Shall we, the pharmacists of Great Britain, avail ourselves of these new facilities for giving to our students a training in chemistry, which shall be rich in its thoroughness and breadth? For one I must emphatically raise my voice in favour of such a policy, in preference to looking to separate classes in chemistry, having a lower and narrower aim. What would be thought of the student having

the opportunity of training in a university, who declined it in order to expend the same sum of money on private tuition? Do we not know that higher education cannot be made self-supporting, but that endowments in one shape or another have to supplement the students' fees? Hence, in the laboratories of which we now speak, it is safe to estimate that for every £10 paid in fees by a student, he receives instruction which has cost, certainly not less than twice or thrice as much money. The teaching of such institutions will not present the bugbear of final examinations as its sole or even its principal object; and those who direct it will not advertise their score in a match against the fourteen of the Board of Examiners. But students entering such schools will have the stimulus belonging to a place of higher education, with intelligent associates pursuing the science for the sake of its other applications, with an *esprit de corps* not confined to their own year, but rich with traditions of names made famous in science. We have occasionally heard the theoretical objection to such a system of mixed teaching that it would divert from pharmacy some of our most promising young men. In the past, pharmacy has lost such, and chemistry has gained them. Shall I name a few? They were Scheele, Davy, Liebig, and Dumas. Does any one regret their change of allegiance? We know how well the science of chemistry has paid back to pharmacy its obligations in this and every other direction. If we inquire what is the system of technical training for pharmacists adopted in Germany, we find that it includes attendance at the classes of the universities, in association with students pursuing the same subjects for other purposes. It is a happy omen for an improved system of education for our students in England, that the Council of the Pharmaceutical Society should have unanimously recorded a general approval of the very able report presented by the Committee on Education. I trust that such evidence as I have now offered of the existence of many facilities available for our purpose will give some encouragement to those who have undertaken this laudable work, to bestow much labour in developing it upon such good foundations. One word on an aspect of this mixed education, which I conceive bears on a question that has previously been raised in this Conference. I allude to that of social disqualification. There are parts of England, where the lines of society are so well marked out that "persons" following our calling are subject to educational disqualifications as to the schools open to their sons and daughters; and in the Mecca of this deeper than religious faith, it is said that men are blackballed at clubs

because their ancestors of three generations back were connected with trade. It is needless to say that this select district is not in the North of England. Soon after the subject had been alluded to in the Conference, a prominent physician, whose writings are in high favour and whom I am privileged to call my friend, poured out the social sorrows of the medical profession, observing that doctors and their wives were "social pariahs." One could not but feel that this strained description should carry some balm to any previously wounded pharmaceutical soul, as proving that our affliction was only one of degree. The question of social lines is not exciting to most of us, but in relation to it I claim a great advantage in this association of our student class with other young men pursuing similar studies.

This is not the place to discuss at length practical questions of pharmaceutical politics. The award of the highest legal tribunal, virtually tearing up the Pharmacy Act of 1868, has thrown upon us the task of once more attempting legislation to avert the retrograde consequences of this decision. It might not unfittingly have been given with the preface once used by a cynical judge, who remarked, "I have not to deal with common sense, but with common law." The result impresses upon my mind one leading lesson, viz., what the lawyers term "the danger of sleeping upon your rights." The story might have been very different had the law-breakers been challenged at the outset, and thus deprived of the invaluable support of many years' possession of the disputed privilege. But our new task imposes new responsibilities, and the preliminary review of our forces should be made useful to estimate their reliability when called finally to action. Will you allow me to say that we want more discipline? When we have again reached the stage of launching a bill to be laid before Parliament, all internal dissensions on its merits should cease, and especially should we place restraint upon any disposition to raise side issues. The next time we bring forward a pharmacy bill, will it be too much to claim that instead of searching for its shortcomings in all directions, we should loyally support it as in 1868?

And now, gentlemen, my task is finished. How imperfectly it has been performed, I am but too conscious. You know that our environments are hard and practical, and not such as surround the favoured few described by Canon Farrer as "those to whom it is given to contemplate the bright countenance of truth in the mild and dewy air of delightful studies." And it has had the yet further difficulty of demanding a hasty survey of many things, when,

to quote Basil Valentine's "Triumphant Chariot of Antimony," "the shortness of life makes it impossible for one man thoroughly to learn antimony, in which every day something of new is discovered." Our art has furnished this illustration to literature:—it is the opening sentence of Professor Morley's "First Sketch of English Literature," and it may well stand as my closing word.

Mr. HEY (York) had much pleasure in proposing that the best thanks of the members be given to the President for his very able address.

Mr. COUPLAND (Harrogate) seconded the motion.

Mr. COMMANS (Bath) supported the motion. Having met Mr. Reynolds at the first meeting of the Conference at Bath, he had much pleasure in seeing him now in the position of President, and seeing that the Conference was founded in what was sometimes called the queen city of the west, it was in every way appropriate that Mr. Reynolds, who would no doubt have been chosen President some years ago but for his unfortunate accident, should receive this honour in York, the chief city of the county where he had made his residence, and where he had laboured so assiduously in connection with the Yorkshire College of Science.

The motion was put by Mr. BRADY, and carried by acclamation.

The PRESIDENT, in reply, said he had always received the greatest kindness from the Conference, but he never had more need of it than on the present occasion. They were all now agreed that without a proper training no one was capable of doing his work properly, whatever it might be,—and they were all going in for a curriculum; but unfortunately there was no curriculum yet laid down for Presidents for such a Congress, and therefore he was in the position of a candidate who had not had the advantage of a previous training. He had seen a book entitled a "School for Fathers," and if there had been a "School for Presidents," he would have taken a full course before coming before them in this position.

Mr. J. R. YOUNG wished to say, on behalf of the North British Branch, that Mr. Stephenson, the President, had intended to be present, and would have been but for unforeseen circumstances.

The reading of papers was then proceeded with.

The first paper read was the following—

REPORT ON THE ESSENTIAL OIL OF GINGER.

By JOHN C. THRESH, B.Sc.,

Pharmaceutical Chemist.

For the purpose of this investigation I had intended to distil a sufficient quantity of the essential oil from a supply of ethereal extract of Jamaica ginger kindly prepared for me by Messrs. Wright, Layman & Umney.

The method proved most tedious and unsatisfactory, only about 12 fluid ounces of oil being obtained from extractive representing a hundredweight of ginger. This yield was considerably less than had been anticipated, since my own researches on a ginger of similar character showed it to contain about 1·4 per cent. of volatile oil. Hanbury and Flückiger (*"Pharmacographia,"* 2nd edit., 577) state that Messrs. Schemmel & Co., of Leipzig, obtain as much as 2·2 per cent.

The oil does not appear to have been previously examined, except by Paponseck (*Wien. Akad. Ber.*, ix., 315), but his results are now of no value.

Upon fractionally distilling the oil, it was found that the quantity was much too small for my labours to produce any satisfactory results. I therefore obtained from the importers about a pint of the oil distilled in Leipzig. Upon submitting this to the process of fractionation, it was found that the higher boiling portions did not correspond with those from the oil distilled by myself, and they were therefore kept apart. The fractions boiling under 185° were so small that it would have been a waste of time to attempt examining them separately, and as they apparently corresponded they were mixed together for further fractionation and examination. Wherever, therefore, in describing the physical and chemical character of these oils, any statement refers to one of them only, the oil distilled by myself will be distinguished by the appellation "English," and the imported oil denoted as "Foreign."

Physical Characters of Crude Ginger Oil.—Pale straw colour, with somewhat camphoraceous odour. The "Foreign" oil was much more fragrant than the "English," but with both, when dissolved in a large proportion of dilute alcohol, the sweet, fragrant odour of Jamaica ginger was most pronounced. Taste aromatic, but not pungent. Consistency not nearly so limpid as essential oil usually, more nearly that of almond oil. Sparingly soluble in rectified spirit, but soluble in all proportions in ether, chloroform, benzol,

carbon disulphide, and glacial acetic acid. The fresh oil forms with glacial acetic acid and rectified spirit clear solutions; but oil which has been kept for some time, when shaken with excess of either of these solvents, forms an opalescent mixture.

Specific gravity, "English," .883 at 63° F.; "Foreign," .9004 at 66° F. Hanbury and Flückiger give the density as .878; Gmelin, .893.

Oil which has been exposed to the air distinctly reddens moistened blue litmus paper. A few c.c. placed over mercury in an inverted test tube, containing a little air, absorbed the oxygen in the course of a few days, and when afterwards a piece of paper soaked in solution of iodide of potassium and starch was dipped into it the paper slowly acquired a blue tint.

The rotatory power of the oil varies in amount, but in direction appears always to be levogyrate. Dr. Symes has kindly examined the oils and the various fractions for me, using the sodium flame and a column of oil 100 mm. long. The results given in this paper are those obtained by him.

For the "English" oil:—

$[\alpha] = -28.60.$

For "Foreign" oil:—

$[\alpha] = -35.75.$

Flückiger found that a column 50 mm. long rotated the ray of polarized light — 21.6°.

A portion of oil exposed to the air in a shallow dish evaporates in part, and the residue rapidly assumes a soft resinous consistency. When cooled in a mixture of melting ice and salt no crystalline matter is deposited.

Strong sulphuric acid dissolves it to a blood-red solution, from which a dark brown oil with terebinthinate odour separates on dilution with water. Even when boiled in this acid no sulphur dioxide is evolved, though of course charring occurs. The product of the action of sulphuric acid on the oil has not been further examined.

Fuming nitric acid acts explosively upon it, forming a somewhat brittle reddish yellow resinous matter with strong odour of nitric oxide. Ordinary nitric acid when shaken with it turns it successively red, blue, and purple, then brisk effervescence takes place and the oil becomes resinous.

Shaken with a saturated solution of sodium bisulphite, no trace of crystalline matter was formed. The various fractions gave also negative results when similarly treated.

Agitated with solution of potash, the volume of the oil was not sensibly diminished, and upon acidifying the alkaline solution and

shaking with ether, only a minute trace of oily matter was left upon evaporation of the ether. This residue dissolved in dilute alcohol gave no coloration with ferric chloride. Neither the alcoholic nor ethereal solution of the crude oil was affected by this reagent.

A portion of the oil was dissolved in about twice its volume of strong alcohol, and digested with its weight of caustic potash in small pieces. The fluid darkened very considerably, a brown oil separating on dilution with water, having if anything a more fragrant odour than the original oil. When distilled a little of the oil (now of its original colour) passed over with the dilute alcohol. The examination of the distillate and of the residue in the flask led only to negative results.

A little of the oil was treated with dilute alcohol and nitric acid, as in Wigger's process. After some weeks the lower surface of the oil became covered with a blackish pellicle, in which the microscope showed entire absence of crystalline matter. Bromine dropped on the oil acted upon it with explosive violence, producing first a purple solution, and afterwards upon addition of more bromine a dark brown resinous substance, much hydrobromic acid gas being evolved.

Dry hydrochloric acid gas, passed into the oil, was absorbed with avidity, the temperature rising considerably and the fluid becoming dark brown in colour. The oil mixed with half its volume of ether and similarly treated became dark purple and deposited black oily drops. Neither by exposure to intense cold, by evaporation, nor by action of strong nitric acid was any crystalline compound obtained. Upon distillation HCl was evolved in abundance.

When distilled after drying over CaCl_2 the oil begins to pass over at about 140°C ., accompanied by a few drops of aqueous fluid. The temperature constantly and rapidly rises to about 240° , the chief portion of the oil coming over between 240° and 270°C . A little passes over between 270° and 300° , but evidently accompanied by decomposition products, and a transparent brown tenacious semi-solid residue remains in the flask.

The "English" oil gave—

| | | | | |
|--|------------------------|-------|----|-----------|
| Boiling below* | 150°C . | about | 5 | per cent. |
| Boiling between 150 – 200°C . | about | 10 | „ | |
| Boiling between 200 – 240°C . | about | 8 | „ | |
| Boiling between 240 – 265°C . | about | 60 | „ | |
| Boiling between 265 – 300°C . | about | 7 | „ | |
| Residue in retort | . | about | 10 | „ |

* All boiling points are corrected for portion of thermometer tube not immersed in vapour.

From the "Foreign" oil was obtained—

| | |
|-----------------------------|----------------------------|
| Boiling below | 210° C. about 17 per cent. |
| Boiling between 210–250° C. | about 15 " |
| Boiling between 250–270° C. | about 45 " |
| Boiling between 270–310° C. | about 10 " |
| Remaining in flask | about 13 " |

The lower boiling products retained the ginger aroma (perceptible when diluted with spirit), and were much more soluble in rectified spirit than the higher fractions. They were shaken with water, then dried over calcium chloride, and redistilled, the portions of both oils boiling below 185° C. collected together, stewed with sodium and repeatedly fractionated over that metal. By this treatment the boiling point was slightly lowered, and most of the oil came over between 155° and 165°. The quantity was too small to allow of the fractionating process being carried very far, and the temperature never remained constant during any of the distillations.

The fraction boiling between 156–161° was finally collected apart, for more extended examination.

The portions boiling between 185° and 250° have not been examined further than to ascertain that they contained oxygenated compounds, and that exposure to intense cold did not cause the deposition of any solid substance.

By continued fractionation of the portions of "English" oil boiling between 240–300° over sodium, the greater portion of it was found to come over between 262–266° C.

From the "Foreign" oil, by exactly similar treatment, was obtained a fraction boiling between 256–260°, and which appeared to be the chief constituent of this oil. The quantity passing over between 262° and 266° was small and not well defined.

The following fractions were finally collected:—

| B.P. | Source. | Rotatory Power. | Density. |
|-----------|---------------------|-----------------|-----------------|
| 145–156 | Both oils | — | — |
| 156–161 | " | +55.60 | .8629 at 19° C. |
| 161–185 | — | — | — |
| *185–250 | English and Foreign | — | — |
| 262–264 } | English | { + 9.00 } | .9028 C. |
| 264–266 } | English | { + 9.75 } | |
| 256–260 | Foreign | - 16.10 | .8990 C. |

* A portion of this boiling between -240° and 250° gave $[\alpha] = +4.50$.

Examination of Solution obtained by Washing Lower Fractions.—The acid fluid obtained by treatment of the first portion of the distillate with water, was neutralized with baryta water, evaporated to a small bulk, and placed over sulphuric acid in the exhausted receiver of an air pump. A crystalline residue was obtained, too small in amount to allow of any quantitative experiments. Its solution reduced silver and mercuric salts, and gave a red coloration with ferric chloride. After removal of the formic acid by silver oxide, the fluid gave all the qualitative reactions of acetic acid.

Portion of Oil Boiling between 145–156°.—All the fractions obtained below 156° were ultimately mixed. The oil was very limpid, terebinthinate in odour, readily soluble in alcohol, combined explosively with bromine and absorbed hydrochloric acid, but deposited no crystalline hydrochloride. Not further examined, but appears to contain a terpene.

156–161° C. Fraction.—This fraction, which undoubtedly consists chiefly of a terpene, is powerfully dextrogyrate and very soluble in alcohol.

Five c.c. (4.315 grams) was diluted with 10 c.c. of chloroform in a small flask immersed in a mixture of melting ice and salt, and bromine gradually added from a narrow tube with capillary orifice. The mixture became purple, but when 6 grams of bromine had been added it was distinctly red. The above-mentioned quantity of a pure terpene would unite with 5.1 grams of bromine to form a dibromide. Upon addition of a further excess of bromine a quantity of acicular crystals rather suddenly formed. A few hours after, upon examining this solution, the crystals had disappeared and were not again thrown down by immersion in the freezing mixture. Upon distillation, free bromine and chloroform came over, leaving a yellowish oily fluid, which when further heated gave off much hydrobromic acid, most of it distilling below 180°; the remainder consisted of a thick tarry oil. This distillate, when oxidized by chromic acid, yielded a considerable amount of terephthalic and acetic acids.

Dry hydrochloric acid passed into another portion of this fraction, gave a purple coloration and caused deposition of a crystalline hydrochloride. When immersed in a freezing mixture the whole became nearly solid, but upon transferring to a filter a considerable amount of dark coloured fluid drained from the colourless crystals.

These crystals were pressed between filter paper, and treated with cold spirit, in which they appeared to be but very slightly

soluble. In a few minutes, however, the crystals began to agglomerate, and finally settled as an oily layer at the bottom of the tube. The fluid portion when distilled gave off much hydrochloric acid, but the distillate, which had a camphoraceous odour, has not been further examined.

No crystalline compound was obtained when the hydrochloric acid was passed into the terpene mixed with a little ether, but a very small quantity of a heavy, dark coloured oil was deposited on the sides of the tube.

The vapour density was determined by a modification of Hofmann's process.

| | |
|--|--|
| Quantity of substance used . . . | 1006 gram. |
| Volume of vapour reduced to 0° C., and 760 mm. pressure . . . | 17.1 c.c. |
| Density (air unity) ∴ | $\frac{1006}{17.1 \times .001293} = 4.55.$ |
| (H unity) | $\frac{1006}{17.1 \times .000896} = 65.8.$ |

Theory for $C_{10}H_{16}$ requires 4.72 and 68 respectively.

These results prove conclusively that this fraction consists chiefly of a terpene. Possibly it may contain cymene, but from combustion of a portion with cupric oxide, in a stream of oxygen, it appears more probable that the chief impurity is a substance containing oxygen, and not readily acted upon by metallic sodium.

4080 gram gave 4364 gram H_2O , and 1.2840 gram CO_2 .

| | $C_{10}H_{16}$ requires. | Found. |
|---------|--------------------------|--------|
| H . . . | 11.76 . . . | 11.89 |
| C . . . | 88.24 . . . | 85.83 |

No doubt by operating upon a larger quantity of crude oil, a much purer product could be obtained.

As before stated, the crystalline hydrochloride, when shaken with alcohol, became converted into a reddish oil, and this has the odour and taste of common camphor. Ignition of .2966 gram of the impure hydrochloride with soda lime gave .055 gram HCl , or 18.5 per cent. The formula $C_{10}H_{16}HCl$, which doubtless represents the pure substance, requires 21.16 per cent. HCl .

Portion Boiling between 161–185°.—The various fractions boiling between 161–185° were mixed, and simply examined for cymene. About 10 c.c. was boiled for about forty hours with nearly a litre of chromic acid liquor. At the end of that time a few centigrammes of a grey crystalline powder was found in the flask. This was washed and purified by solution in hot ammonia water, and re-

precipitation by an acid. It gave all the qualitative reactions of terephthalic acid, being almost unaffected by alcohol, ether, and acetic acid, subliming without previous fusion, etc. A portion of the acid liquor was distilled, and acetic acid found in the distillate. It is exceedingly probable, therefore, that this fraction contains a small portion of cymene.

Fraction from "Foreign" Oil Boiling between 256–260°.—This fraction appears to consist of a hydrocarbon, $C_{15}H_{24}$, corresponding to those found in cubebs, copaiba, etc. It is only slightly soluble in alcohol, forms a slightly turbid mixture with ether, combines with bromine with explosive violence, and absorbs hydrochloric acid with elevation of temperature. Strong nitric and sulphuric acids react upon it as upon the crude oil. A few drops exposed to the air for days in an open dish did not resinify. A portion always becomes polymerized by distillation. When HCl is passed into this fraction, and the vessel containing it immersed in a freezing mixture, a reddish solution results. If the fluid is allowed to become warm the mixture turns purple. Mixed with half its volume of ether and saturated with the dry gas, a small quantity of a nearly black oily matter is deposited, which is insoluble in ether. Neither upon evaporation of the ethereal solution, nor by immersion in a freezing mixture, or action of strong nitric acid, have I succeeded in obtaining a crystalline hydrochloride. As the liquid appeared to be in a great measure decomposed by washing and distilling, a portion of the mixture with ether, after treatment with HCl , was placed in a flask on the water-bath, the ether distilled off, and a current of dry hydrogen transmitted through it until the escaping gas no longer reddened moistened blue litmus paper. The sp. gr. of the liquid thus obtained was .9246 at 60° F.

By ignition with caustic lime, .9290 gram gave .0508 HCl . This closely agrees with what is required by formula $(C_{15}H_{24})_3HCl$.

| Theory. | Found. |
|------------------------|--------|
| 5.62 per cent. HCl . | 5.47. |

By combustion with granulated cupric oxide in a stream of oxygen the following results were obtained:—

| | | |
|-----------------------------|-------|-------------|
| Quantity of substance burnt | . . . | .4152 gram. |
| H_2O produced | . . . | .4450 " |
| CO_2 " | . . . | 1.3854 " |
| $C_{15}H_{24}$ Theory. | | |
| H | 11.76 | 11.90 |
| C | 88.24 | 87.71 |

Fraction from English Oil Boiling between 262–266°.—This fraction differs from the one last described in boiling point and action upon a ray of polarized light. It reacts with bromine, hydrochloric acid, etc., exactly as the latter. Probably, however, when treating the ether mixture with dry HCl a little more of the insoluble heavier oil is deposited. A portion of the liquid hydrochloride was washed with water and dilute alkali, dried over calcium chloride, and a portion ignited with caustic lime. .8045 gram gave .0403 HCl, or 5.01 per cent. The density of the washed compound was .9230. It would appear as though slight decomposition had taken place during the washing and that the deficiency in HCl and lower density of the compound (compared with the fraction from the foreign oil) may thus be accounted for.

The portion of "English" oil boiling over 266° was found to yield on distillation with sodium a fraction boiling about 272°, and which upon treatment with ether and hydrochloric acid reacted like the fraction of lower boiling point, save that more of the black insoluble oily matter was deposited from it. It has not been further examined, neither has the portion boiling above 260° of the "Foreign" oil.

The residue left in the flask after distilling off all that would pass over below 300° was dark brown, transparent, semi-solid, and with an odour of copaiba. This odour was more apparent if the distillation was stopped at about 280° C., as above this point the residue darkened much in colour, the oil passing over becoming first pale blue, then towards 300° C. a dark dirty blue.

The non-volatile portion yielded nothing to boiling potash ley, or to ammonia, and appeared to consist of colophony and probably other products of the polymerization of the terpenes (by heat), and of their oxidation, but evidently contained no resin of an acid character, nor any substance capable of dissolving in or combining with the alkalis.

Summary.—This imperfect examination of the essential oil of ginger shows at least that it is an exceedingly complex mixture of hydrocarbons, and of their oxidation products.

The more volatile portion contains the odorous principle (most probably an oxygenated compound), and is most susceptible of oxidation. The soft, resinous, fragrant matter which gradually forms on the lid of a jar containing ground ginger is doubtless produced by oxidation of the oil, which slowly volatilizes at ordinary temperatures and condenses on the lid.

Both the oils examined consist chiefly of a hydrocarbon, probably

with formula $C_{15}H_{24}$, but the hydrocarbon of the "English" oil is isomeric with that of the "Foreign" oil, the former boiling at a higher temperature, and differing remarkably from the latter in its action on a ray of polarized light. Their compounds with hydrochloric acid appear to correspond.

Cymene is a constituent of the distilled oil, and most probably of the crude oils, unless, as has been suggested by Wright, some constituent of formula $C_{10}H_{16}O$ has by the action of the heat been decomposed, yielding water and cymene.

The portions boiling below 161° consist chiefly of a terpene, which probably, if further purified, would have been found to correspond with those of Tilden's* first group.

The crude oil also contains a little formic and acetic acids.

Notable quantities of aldehydes and ethereal salts are absent.

Of the oxygenated constituents nothing whatever is known, my limited time and the small quantity of oil at my disposal having precluded the investigation being carried further at present.

As a matter of some pharmaceutical interest, it may be mentioned that a dilute alcoholic solution of the ginger oil is a remarkably good flavouring agent, capable of imparting to a very considerable proportion of aqueous fluid the very pleasant aroma of Jamaica ginger.

A vote of thanks having been passed to Mr. Thresh,

Professor ATTFIELD said the Congress might be congratulated on the very admirable series of papers presented, on that and former occasions, on the chemistry of ginger, by Mr. Thresh, and it was an illustration of the advantages derived from the grants made by the Conference in aid of research. He might repeat what he had before said, that no one engaged in any research need feel the slightest hesitation in applying to the Conference for a grant in aid of the expenses incurred in connection with it. He himself should make such an application if necessary, and it seemed to him unnecessary that any private individual should incur expense in the purchase of materials for carrying out a research, when it was the privilege of the Executive to pay such expenses. Mr. Thresh had alluded to his former papers on this subject, especially on the soluble essence of ginger. As it was a very interesting subject, he should be glad to know from Mr. Thresh if he had worked out any improvement in connection with the essence of ginger, the formula

* *Journ. Chem. Soc.*, clxxxii., 84.

for which had been very much appreciated by pharmacists. He would also ask him if he was quite sure that the foreign oil of ginger referred to in the present paper was genuine. Usually, those chemists who worked at these researches had to apply for the raw material to manufacturers, who generally considered themselves privileged in being allowed to contribute to research by producing the raw material on the scale which they alone could adopt. He had no reason to doubt that the foreign oil of ginger referred to was absolutely pure, but in such cases it was well to have a guarantee of purity, as otherwise the investigator might be led into a whole train of errors, which would creep into text-books, and be perpetuated for half a generation.

Mr. THRESH said his experiments on the soluble essence of ginger had been very few during the last two years. The general complaint was that the process he formerly gave was too complex, and many suggestions had been made for improving it; but on trying them he did not find that any gave a better result, or with less trouble. The only suggestion he could offer as a possible improvement on the original process, was the use of tartaric acid instead of sulphuric, for removing the last trace of lime from the solution. With regard to the purity of the essential oil, his supply was obtained from Messrs. Warwick, who got it from Leipzig, and he had no doubt of its purity. He got from both oils about the same proportion of the higher boiling products. He could not see how it could be adulterated, as in both cases there was 50 to 60 per cent. of this principal constituent. In one case he obtained it almost altogether 6° below the corresponding fraction obtained from English oil, and he should have expected to find at least some fraction of the higher boiling point if it were adulterated with oil of a lower boiling point; but that fraction seemed to consist altogether of an isomeric compound. If there were adulteration with anything of a lower boiling point, he should have expected to find either alcohol or something of the character of turpentine; but there was certainly no alcohol present, and the small amount of terpene proved that there was nothing of the character of turpentine added to it.

Mr. T. B. GROVES (Weymouth) said the complaint he had to make of these highly prepared essences which yielded a soluble product was, that a great part of the flavour was gone, and it was not at all like that of fresh ginger. A simple and economical way that he had adopted for making a soluble essence of ginger was by using a weak instead of a rectified spirit. By employing a mixture

of $2\frac{1}{2}$ volumes of water with $5\frac{1}{2}$ of rectified spirit he got an essence which was very fairly soluble, while it retained all the aroma of the ginger root. He had made it in quantities for some years for a soda water firm with which he was connected.

Mr. THRESH said if an essence of ginger were made with strong rectified spirit, then diluted with about half its volume of water and shaken up with silica or powdered pumice, an essence was obtained sufficiently soluble for most purposes, but it was deficient in aroma; this, however, could easily be supplied by the addition of a little of the imported oil. The aroma imparted by one or two drops of this essential oil was exceedingly fragrant.

Mr. SHENSTONE asked if the preparation of the oil in this way would be economical. He had made several experiments of this kind, and he generally found that the active principle kept disappearing as he went on. He once took a pint of oil of lavender and kept distilling it to get out the active principle, and at last he got something less than 2 drachms, but he felt sure that he had more of that constituent when he began than when he left off, though where it went to he could not tell.

Mr. THRESH said the essential oil as imported was only 3s. an ounce, and an ounce would go a very long way. So far as the constituent to which the odour was due was concerned, that could not be obtained economically; it did not depend on a terpene or a terpene polymer, and what it did depend on he could not tell. But when one reflected how small a quantity of musk would impart an odour to a large room, it was not surprising that a very small quantity of a highly odorous principle should impart to the whole essence a powerful odour of ginger. He had tried particularly to isolate this one principle, but had failed.

Mr. PROCTOR (Newcastle) asked what percentage of oil Mr. Thresh obtained from the ginger, and also whether there was any difference in it according to the variety of ginger employed. Some years ago, in preparing some gingerene, he noticed repeatedly an odour strongly resembling that of lemons in one part of the process, where the resinous matter was being separated from the gingerene, and it occurred to him that there might be differences in different kinds of ginger, and that there might be different odours and different compositions in the essential oils.

Mr. CLEAVER (London) said that in preparing oil of ginger some time ago, he found the product had very little of the odour of dried ginger, but upon rubbing it in the hand the odour came out very well. He also tried to prepare the oil by preparing a rectified

tincture and distilling that, but could not succeed. He should like to know whether Mr. Thresh had experimented in that direction. With regard to soluble essence of ginger, he had made a great deal of it, but the great difficulty was, that if kept for any length of time the odour seemed to disappear, whether it were made originally from rectified or more dilute spirit. With regard to Mr. Groves's method, he would ask if there was not a difficulty in clarifying the product; he had not been able to get a clear preparation in that way, and the great desideratum with the makers of ginger beer was a perfectly clear soluble essence. He should also like to know the kind of ginger Mr. Thresh employed, as it was well known that different varieties of ginger gave oils of quite different odours.

Mr. GROVES said a weak tincture, such as he had described, could not be easily filtered, but it would deposit on standing and become bright. When diluted with water it did not form a perfectly bright liquid, but it was bright enough for all practical purposes.

Mr. PROCTOR said twenty years ago he adopted a method of clarifying such a preparation. It consisted in adding water to it, and then a small portion of sulphate of alumina. Upon subsequent treatment with an alkali—lime or potash—the alumina was thrown down, carrying with it the resinous matter. In this way he got a perfectly bright solution for making syrups or anything of that kind.

Mr. THRESH, in reply, said in his researches on the ginger root, he found the active principle was exceedingly soluble in highly dilute spirit, and the same was the case with the principle to which the aroma was due. It came over with the first portion of the distillate. He could not account for the fact mentioned by Mr. Cleaver, that upon distilling the spirituous solution an oil passed over which had not the odour of ginger, unless the essential portion was lost; what was obtained at the higher boiling point had an odour, when purified, resembling balsam of copaiba. The proportion of oil obtained was 12 ozs. from the cwt. of root, and the kind used was the Jamaica ginger. Messrs. Schemmel said they obtained as much as 2·2 per cent.; he found he could obtain from 1·4 to about 1·9, with a sample of root he used; operating on a small scale, he found he got 1·4, and he expected to be able to get out that quantity, but through the loss in the process, and the difficulty of getting over the higher boiling portion, even when using superheated steam, he only got 12 oz., or about half the theoretical quantity. The odour of lemons might be due to cymene, which it was well known had

that odour. As to the loss of odour in preparing the soluble essence, he had noticed that in treating ginger with lime and other substances, the odour became impaired, but that difficulty was got over by adding to the final product a very small quantity of the essential oil.

The next paper read was entitled—

FURTHER NOTES ON GLYCELÆUM.

By T. B. GROVES, F.C.S.

Fourteen years ago, at the Conference meeting held at Dundee, a paper was read on "Glycelæum, a proposed Basis for Ointments." Unfortunately for me and my suggestions, I was unable to be present; moreover, my specimens were not forthcoming, so that the matter attracted little attention and was soon forgotten. Some of my better known friends, however, were good enough to repeat my experiments, but having in so doing exhausted my stock of sweet almond cake, they prevented me from continuing the inquiry, as doubtless I ought to have done; for I found that the only almond meal obtainable in the market was that of the bitter almond.

Recently I have had my attention directed to the subject, and the preparation required being for outward application only, I was led to experiment on the meal of the bitter almond, which for such purpose answers nearly as well as that of the sweet almond.

In another respect I have altered my formula. I now use diluted glycerine instead of the concentrated, believing that the latter is, from its aptness to absorb moisture from the surface to which it may be applied, liable to cause irritation. The formula I recommend for the emulsifying agent is as follows:—

| | |
|-------------------------------------|--------|
| Finely powdered Bitter Almond Cake. | 1½ oz. |
| Pure Glycerine | 3ij. |
| Water | 3j. |
| Mix. | |

It is best to prepare this mixture some little time beforehand, so that time may be given for the emulsin to enter into solution. However, this is not essential unless the development of the prussic acid reaction be deemed important. The progress of this reaction is in such a mixture singularly slow in the cold; probably the application of a gentle heat would hasten it. Care should be taken

to thin the mixture with glycerine and water, should it from any cause become too pasty in consistence.

I find that $\frac{3}{4}$ of an ounce of the emulsive can be made readily to combine with $1\frac{1}{2}$ fluid ounce of most oils by merely stirring them together in a mortar. A much larger amount could be induced to enter the combination by slicing it in with a flexible spatula, but there is no advantage to be gained in so doing. It is singular that castor oil, which *primâ facie* appears so emulsible, refuses to form a glycelæum ricini, thus accentuating the peculiarities of its chemical composition. Which of its constituents it is which effects the precipitation of the emulsin I have not ascertained. Speaking generally, all oily bodies, whether fixed or volatile, whether combined with resins or not, are, provided they do not contain some constituent effecting the precipitation or curdling of emulsin, capable of forming glycelæa. Spirit of turpentine, paraffin oil, benzol, and such bodies are somewhat stubborn, but by using the spatula instead of the pestle they can be made to form glycelæa containing about two-thirds of their bulk of the respective oils.

I must now confess to an error in my former paper. I hastily assumed that glycelæa might be stiffened by combining them with chemically inert powders. Such is not the case; whenever such powders are added in sufficient quantity to affect the extensibility of the emulsive, the combination is at once broken up and its constituents assume their original liquid form. This happens when such substances as prepared chalk or liquorice powder are employed. Tannic acid and oxide of zinc act chemically as well as mechanically. Among substances incapable of being added to glycelæa, except in restricted proportions, are wood tar, carbolic acid, creasote, Peruvian balsam. This last substance, however, can be made to take its place in almost any proportion, by first causing it to part with its resin. This is done by warming together olive oil and the balsam until the separation takes place. The liquid portion, consisting mainly of olive oil *plus* cinnamein, is strained when cold, and then can be as readily combined with the emulsive as pure olive oil. Such a preparation would be found useful as an application to chapped hands, for winter use.

Glycelæum olivæ is not disturbed by the addition of one-twelfth finely powdered borax, nor by sulphate of zinc in the proportion of 16 grains to the ounce.

The specimens I have the honour to present are glycelæum olivæ, glyc. olivæ peruvianum, glyc. picis barbadiensis, and, finally, the emulsive mixture used in forming them. I must explain that the

Barbadoes tar has been thinned by adding to it half its bulk of benzol, before attempting to combine it with the emulsive. In this condition it enters readily into combination.

Viewed microscopically, these glycelæa are seen to be true emulsions, the globules being somewhat irregular in size; but that would, I imagine, greatly depend on the amount of work performed by the knight of the pestle. That the emulsions are not white is due to the fact that the globules are nearly contiguous; as soon as water intervenes and separates them, reflection from one to the other becomes possible, and then the sensation of whiteness is experienced.

A vote of thanks having been accorded to Mr. Groves,

Mr. THRESH asked if Mr. Groves had had any experience of this substance as a basis for ointments of iodide of cadmium and iodide of lead. There was a demand for some non-fatty basis for ointments, especially in the case of such preparations as he had mentioned, which left a nasty greasy stain on the skin, not easily removed. He had tried a soap basis, which answered with some things, but not with iodide of lead, as chemical action took place.

Mr. GROVES said his experience in the use of this substance was almost *nil*, but it seemed to him worth attention, and that it might be varied in a great many ways. Glycerine itself was an excellent solvent; so were oils, and both might be used for taking up active principles. When applied to the skin the preparation had a softening effect; and it really touched the skin in a manner that a fatty basis did not. In a case of abrasion of the skin, any exudation combined with the glycelæum, forming a protective fluid very much the nature of pus. It would be well if some one who had the opportunity would take occasion to experiment with it in hospitals.

Mr. PROCTOR asked if any separation of the glycerine had been noticed after a preparation had been kept for some time. Soon after Mr. Groves' former paper he made one or two experiments and found that a separation took place; probably because the glycerine absorbed moisture and became too fluid. He found that acids broke up some similar emulsions, and would like to know if this glycelæum was compatible with acids.

Mr. GROVES said certainly, if they were not such acids as would precipitate the emulsin.

The next paper read was the following—

NOTE ON POPPY HEADS.

By T. B. GROVES, F.C.S.

Without wishing to assert that the chemistry of the poppy does *not* require further investigation, I think I am entitled to complain of that part of No. 246 amongst "the Subjects for Papers" on the blue circular,—which states that "morphine, narcotine, and meconic acid have been detected in the capsules, but nothing definite appears to be known as to the occurrence therein of the other principles of opium."

So long ago as October, 1854, I announced the finding of codeia, and presented to the meeting then being held a specimen of it. I also showed narceia; but on this I will not insist, as I was not at the time certain of its identity. In the year 1865 I repeated my experiment on a larger scale, using 50 pounds of poppy heads. The results obtained have not been reported in detail, though I have recorded somewhere in our *Year-Book* the fact that I had isolated from the poppy capsules then operated upon, of morphia 75 grains, of narcotine 36 grains, of codeia 33 grains, of narceia 23 grains,—all crystallized and in fairly pure condition.

One has heard of the maxim "*De non apparentibus et non existentibus eadem est ratio*," so, to prevent its being hurled at my head, I produce the specimens themselves. I have copious notes of the various steps of the process of extraction, but on looking through them I find little that would repay the trouble of reproduction. My main object in repeating my experiments was to see if codeia, which as compared with morphia exists in the unripe poppy capsule in considerable quantity, could be extracted therefrom in paying quantities. The answer to my inquiry was unmistakable—it could not. In the first place its total amount was insufficient; in the next place a very considerable loss was sustained in consequence of the troublesome abundance of extractive and resinoid substances accompanying the active principles, and rendering isolation and purification extremely laborious and difficult.

The term "other principles of opium" is, of course, a very elastic one; the principles of opium are legion, and I would suggest to any one who is "fond of pure vexation and likes procrastination," that he could not do better than attempt the complete elucidation of the chemistry of the ripe poppy capsule, where probably organic principles are to be met with in even greater variety than in opium itself.

May I, in conclusion, express the hope that when the next blue

circular appears codeia and narceia may be added to the list of substances that have been detected in the poppy capsule.

The thanks of the Conference having been passed to Mr. Groves for this paper,

Professor ATTFIELD remarked that perhaps some apology was due to Mr. Groves from the Executive, that the notice of this alkaloid had not appeared in the blue list. But perhaps it would be some satisfaction to him, and certainly was matter for congratulation generally, that the omission had produced a very interesting note.

Mr. J. R. YOUNG (Edinburgh) was very pleased to see that Mr. Groves had obtained these principles in such quantity and purity. He hoped others would be encouraged to make investigations in the same direction.

Mr. J. WILLIAMS (London) asked if the quantity of alkaloids obtained might be taken to be an average, or did it only represent one particular sample. He put the question because the proportions were so different to those in the ripe capsule.

Mr. GROVES said the quantities given were the real proportionate quantities. It was very striking that the morphia existed in so small a proportion as compared with codeia and narceia.

A paper was then read on—

THE ESTIMATION OF IODIDE OF IRON.

By WILLIAM A. H. NAYLOR, F.C.S., AND DAVID HOOPER.

The methods which have hitherto been suggested for the estimation of iodide of iron, whether in aqueous or saccharine solution, require the observance of special precautions and the consumption of much time. It seems not improbable that these two conditions may have a tendency to induce the busy pharmacist to neglect the examination of the syrup of this salt, which the Pharmacopœia directs should contain 4·3 grains of iodide of iron in one fluid drachm.

The object contemplated by the authors of this paper is to supply a process for the quantitative determination of iodine in a syrup or liquor containing iodide of iron, which for accuracy shall closely approximate to the most reliable gravimetric method, shall be easy of application, and withal shall admit of rapid execution.

The agent commonly employed for the liberation of iodine from this combination is ferric chloride. Potassium chlorate has recently

been recommended. Peroxide of hydrogen, potassium bichromate with sulphuric acid and potassium permanganate, may also be used for this purpose. It is to be observed, however, that in each case the iodine must be removed from solution before it can be titrated with sodium hyposulphite or stannous chloride. The reason of this arises from the necessity of using an excess of the agent which liberates the iodine and which would act upon the iodide compound formed on the addition of the standard solution. Another source of error would be the consumption of standard solution by the ferric salt produced in the reaction. To remove the free iodine it is recommended to distil and collect its vapour in water in which has been dissolved potassium iodide; the distillate may then be titrated directly by *v. s.* hyposulphite. The bumping and frothing of the liquid in the retort, the irregularity with which the iodine passes over, and the provisions to be made against the loss, constitute serious inconveniences to the distillation method, and render its adoption by pharmacists at least undesirable.

There is, however, another means of removing the free iodine, *viz.*: agitation of the solution with such liquids as benzol, ether, carbon bisulphide, and chloroform. Of these solvents of iodine we give preference to carbon bisulphide, partly from its capacity to dissolve more of this element than the other liquids named, and partly on account of the rapidity with which it separates from the syrupy iron solution. When hydrogen peroxide is used to liberate the iron, a little of it appears to be dissolved by the carbon bisulphide, causing the results to come out somewhat too high, consequent upon the decomposition of the sodium iodide formed by the reaction of the iodine upon the sodium hyposulphite. Potassium permanganate proved still less manageable from the tendency manifested by the acidified solution to become muddy and deposit. The mode of working in this direction may thus be briefly described. Into a 100 c.c. stoppered separatory funnel put 5 c.c. of the syrup to be examined, and add 10 c.c. each of a 10 per cent. solution of potassium bichromate and acid sulphuric 1 : 4. Pour in 20 c.c. of carbon bisulphide and agitate; when the liquids are at rest run off the lower stratum into a flask; treat the liquid in the funnel with another 20 c.c. of carbon bisulphide, and proceed as before. Now titrate the mixed iodine solutions with *v. s.* sodium hyposulphite. The discharging of the delicate colour of the iodine solution affords a very accurate indication for reading the burette. The whole of the carbon bisulphide may be recovered by washing with water. The following table gives the results of some estimations

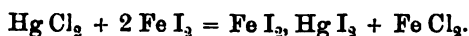
obtained by this method, of a commercial sample of syrup, the iodine in which had first been determined gravimetrically, when .320 gram was found to be contained in 5 c.c.

| No. c.c. of Syrup taken. | Iodine found. | Iodine in 5 c.c. |
|--------------------------|---------------|------------------|
| 2 | .130 | .326 |
| 3 | .195 | .326 |
| 4 | .260 | .325 |
| 4 | .260 | .325 |
| 5 | .326 | .326 |
| 5 | .327 | .327 |
| 5 | .327 | .327 |

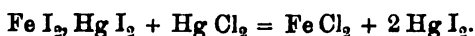
Although these figures are too high, it will be noted that the greatest error does not exceed .14 per cent. by volume. It will be evident that this mode of working is free from those inconveniences which invariably accompany the distillation of iodine, and, therefore, in our opinion deserves the preference.

But we now propose to describe a method, which on account of the facility with which it can be applied, the expedition with which it can be performed, and the accuracy of the results obtainable by it, must take precedence of the above. It is based upon the fact that certain iodine compounds form double salts with mercuric chloride, which remain in solution until an excess of the latter reagent is added, when mercuric iodide becomes precipitated. Taking advantage of this fact, M. Personne has devised a method for the volumetric estimation of iodide of potassium. It occurred to us that possibly ferrous iodide might be substituted for the alkaline salt. We commenced experimenting in this direction, and had the satisfaction of finding our suppositions fully confirmed.

We have employed a semi-decinormal test solution of mercuric chloride, this being the strength prescribed by Personne, and it will be found to be convenient for estimating either potassium or ferrous iodide. Each 10 c.c. of the volumetric solution will contain .1355 gram of the salt, and will be equivalent to .254 gram iodine, according to the following equation :—



Here two molecules of iodine are seen to require or to consume one molecule of mercuric chloride. The further addition of the latter salt would produce a precipitate of biniodide, thus :—



The mode of working is very simple, and consists in dropping from a burette the volumetric solution into a measured quantity of syrup in a flask, diluted with about ten times its quantity of water. A rotary motion must be communicated to the flask after each addition of the mercuric chloride; the end of the reaction will be indicated by the appearance of a feeble precipitate which remains permanent and imparts a scarlet colour to the liquid. The degree of accuracy attainable by this method may be judged of by the following results :—

| Iodine per 5 c.c. determined gravimetrically. | Iodine per 5 c.c. determined volumetrically. | |
|---|--|---------|
| ·2864 | ·2858 | Syrup. |
| ·2864 | ·2827 | " |
| ·2410 | ·2413 | " |
| ·2410 | ·2413 | " |
| ·263 | ·264 | Liquor. |
| ·263 | ·264 | " |
| ·425 | ·423 | " |
| ·425 | ·429 | " |
| ·2383 | ·2388 | " |
| ·2383 | ·2388 | " |
| ·2772 | ·2770 | " |
| ·2323 | ·2302 | " |

The next table represents the results obtained from an examination of commercial samples of syrup purchased from retail houses of repute in London and the provinces. One sample only was supplied by a house exclusively wholesale. As a feature in this inquiry, we would draw attention to the circumstance that the iodine has been estimated in each case gravimetrically as silver iodide, and we have not found the sugar to present any obstacle to its accurate determination.

| | Iodide per 5 c.c. determined gravimetrically. | Iodide per 5 c.c. determined volumetrically. | Grains of Iodide Iron per fluid drachm. |
|----|---|--|---|
| 1 | ·3091 | ·3086 | 4·1 |
| 2 | ·3015 | ·2985 | 4·0 |
| 3 | ·2972 | ·2978 | 3·9 |
| 4 | ·2950 | ·2960 | 3·9 |
| 5 | ·2864 | ·2890 | 3·8 |
| 6 | ·2788 | ·2783 | 3·7 |
| 7 | ·2718 | ·2680 | 3·6 |
| 8 | ·2550 | ·2550 | 3·4 |
| 9 | ·2437 | ·2428 | 3·2 |
| 10 | ·2340 | ·2340 | 3·2 |
| 11 | ·2107 | ·2082 | 2·8 |
| 12 | ·2032 | ·2034 | 2·7 |

In looking over this table, the first point to be noted is the close correspondence between the gravimetric and volumetric methods employed for estimating the iodine. The other point is less satisfactory, seeing it reveals a not inconsiderable deficiency of ferrous iodide in the syrups examined. For the present we prefer to abstain from offering any remarks in explanation of this deficiency beyond expressing our belief that it is due to causes traceable to sources other than its manufacture. We may, however, state that the subject has occupied our attention for some little time past, and experiments have been instituted with a view to its elucidation.

The PRESIDENT in proposing the usual vote of thanks, remarked that this paper involved a large amount of work, a great number of determinations having been necessary to its production.

Mr. STANFORD said he had had no experience of this process, but he should have thought the presence of sugar would have had some effect on it. It seemed, however, to be accurate.

Mr. M. W. WILLIAMS said if this process consisted in the addition of mercuric chloride to the solution of the iodide, it must be that the analyses were correct, but he did not quite gather whether that process or the reverse was adopted. Now if the iodide were added to the mercuric chloride, he could hardly imagine that the results would be correct, i.e., if the chloride were dissolved by adding an excess of iodide. Some time ago he devised a process which was much more simple and easily performed than any he had seen, but he did not know whether it was original or not. It did not pretend to a degree of accuracy which was compatible with a determination of the atomic weights, but it was quite sufficient to determine the strength of pharmaceutical preparations. It was a process very similar to nesslerization, in which a measured volume of the iodized solution was put into a nessler glass, and the coloration produced by the addition of platinum perchloride compared with that produced in a standard solution of iodide of potassium. When the platinum perchloride was added to the iodide, a deep colour was produced which was almost independent of acidity. By this means the amount of iodide could be determined within $\frac{1}{8}$.

Professor ATTFIELD said the very high accuracy of Personne's method, on which Mr. Naylor's was based, led him to think it was worth attention. He took some trouble some years ago to test it, and he could assure the members that it might be thoroughly depended on. The remarks of Mr. Williams rather led him to hope

that he would put his results together, and give the Conference the benefit of a paper on another occasion.

Mr. GROVES said he recollected some years ago seeing the volumetric use of bichloride of mercury in testing iodide of iron recommended in the *Pharmaceutical Journal*. Of course Mr. Naylor was entitled to the thanks of the Conference for the work done, but he feared the process was not so original as imagined by him.

Mr. FLETCHER asked if Mr. Naylor had tried the process on syrup made according to the B.P., both freshly prepared, and after it had stood for, say a fortnight, and again after a long interval. In a paper communicated to one of the Evening Meetings last year, Mr. R. H. Parker gave a process for estimating the iodine in syrup of iron, which showed some very remarkable results, the iodine disappearing in a mysterious manner after the syrup had been kept for some time. It was evident that the compilers of the Pharmacopœia process relied on the specific gravity of the compound as an evidence of its trustworthy preparation, and there was no doubt that if the syrup were not prone to change, the specific gravity would be a very valuable indication; but as most pharmacists knew, the syrup soon developed hydriodic acid, thus causing the conversion of a portion of the cane sugar into grape sugar, which was thrown down and the specific gravity lessened. He should like to know if Mr. Naylor had found that hydriodic acid interfered with either of the processes he had indicated, and especially if he had made an examination of syrup carefully prepared by himself, both when fresh and after some lapse of time.

Mr. NAYLOR said he had prepared some syrup according to the B. P. formula, and estimated it both gravimetrically and volumetrically by this method, and he had found that a fortnight afterwards it had lost a considerable amount of iodine. In another fortnight it had lost still more iodine. He had not tried the method proposed, based upon the use of perchloride of platinum, but it would certainly not appear to be a particularly delicate test for measuring iodine quantitatively, as it was well known in nesslerization what variable results different individuals might get, and he presumed that a very small quantity of the syrup, and especially of the liquor, would have to be taken, so that any error would be greatly multiplied. Moreover, a volumetric solution of iodide of potassium would have to be made, and he did not know that there was any greater difficulty in making a volumetric solution of perchloride of mercury. He was not aware that this method had been mentioned before, and thought he had looked up all the

literature on the subject, but it was possible the paper Mr. Groves referred to had escaped his observation.

The Conference then adjourned for luncheon.

Upon resuming, the first paper read was—

ON THE PROXIMATE PRINCIPLES OF HENBANE.

BY E. MERCK, DARMSTADT.

I have pleasure in complying with the request of your President, who has asked me to express the present state of our knowledge of the proximate constituents of henbane. Mr. Reynolds tells me that in England the physiological action of crystallized hyoscyamine has not been found to correspond with that of extractiform hyoscyamine, leading to the belief that the latter contains more than one potent principle. This supposition is well founded.

Professor Ladenburg, in continuing his researches on the mydriatic alkaloids of the Solanaceæ, has definitely confirmed the existence of a second alkaloid in *Hyoscyamus niger*. The presence of this alkaloid was indeed suspected from the difference in the physiological action between the crystallized and the amorphous (coloured) hyoscyamine. Dr. Ladenburg calls the new alkaloid "hyoscine," a name which has already been applied by Holm and Reichardt to the decomposition product obtained by the action of barium hydrate upon hyoscyamine. The designation "hyoscine," given to the latter body, is however superfluous, as there is no doubt that it is identical with tropine.

The hyoscine of Ladenburg is isomeric with the other two mydriatic alkaloids of the Solanaceæ, atropine and hyoscyamine, and has accordingly the empirical formula $C_{17}H_{23}NO_3$. Whilst, however, atropine and hyoscyamine split up into tropic acid and tropine, hyoscine yields as decomposition products, tropic acid and pseudotropine.

The following synoptical account of the three mydriatic alkaloids, and of their origin, according to the new views may serve to render their relations clearer:—

1. *Atropine* occurs—

- (a) In *Atropa belladonna*, L. Is the "atropin verum." Is also known as "heavy atropin."
- (b) In *Datura Stramonium*, L. Is "daturin verum" or "heavy daturin."

2. *Hyoscyamine* is found—

- (a) In *Hyoscyamus niger*, L. It is from this source that the hyoscyamine of Merck is prepared.
- (b) In *Atropa Belladonna*, L. So-called "light atropine." It is sometimes met with in commerce as atropin.
- (c) In *Datura Stramonium*, L. Commonly known as "light daturin."
- (d) In *Duboisia myoporoides*, R. Brown. So-called duboisine.

3. *Hyoscine*.—As yet only found in *Hyoscyamus niger*. Hyoscine dilates the pupil like atropine, to which alkaloid, indeed, it bears considerable resemblance in physiological action.

Professor Edlefsen, of Kiel, has instituted a number of clinical trials with hyoscine, which, so far as they have gone, have shown that in certain cases it exercises a more constant and surer action than atropine, and that it also possesses a soothing and soporific influence. Professor Edlefsen has obtained from hyoscine beneficial results in the treatment of whooping cough, asthma, and epilepsy. These trials cannot yet be considered as in any way concluded, but they already serve to show, as indeed was to be anticipated, that in the new alkaloid we possess a pure and trustworthy remedy. Hyoscine hydriodate is the salt which has been most commonly employed. I have also prepared hyoscine hydrobromate.

The PRESIDENT said the fact of Mr. Merck not being a member of the Conference rendered it all the more incumbent that he should be thanked for sending this paper. He had asked Mr. Merck to contribute a paper upon this subject, because he was recognised as a high authority on the principles of henbane, and the large use of hyoscyamine in the extractive form made it of greater interest to pharmacists from year to year. Mr. Merck had also sent a specimen of hydriodate of hyoscine.

Mr. MANON asked whether Mr. Merck obtained his hyoscyamine from first year's plants or second.

The PRESIDENT said the paper did not state; but last year at Swansea it was stated by some one who would be likely to know, that the first year's plants were the material used in Germany.

Mr. CLEAVER asked if any of the members had had opportunities of examining the relative values of the annual and biennial varieties, for the production of hyoscyamine. The B. P. ordered the use of only the biennial variety; but he believed it was a matter of manufacturing knowledge that the annual variety yielded as much if not more.

The next paper read was on—

THE PHARMACOPŒIA TEST FOR PEPSINE.

By F. BADEN BENDER, F.C.S.

The Pharmacopœia process for testing pepsine is unnecessarily tedious, and the conditions imposed are too indefinite to yield satisfactory results.

It is described as follows:—

“Two grains of it with an ounce of distilled water, to which five minims of hydrochloric acid have been added, form a mixture in which 100 grains of hard-boiled white of egg, in thin shavings, will dissolve on their being digested together for about four hours at a temperature of 98°.”

In order to remedy the first defect, that of tediousness, I would suggest that the temperature be raised to 130° F., at which point the action of pepsine is very much more rapid than at 98° F. M. Petit states (*Journ. de Phar. et de Chimie*) that it is four times more active at 50° C. (122° F.) than at 40° C. (104° F.), and my own experiments confirm this statement. Further, *cæteris paribus*, the rate of solution of coagulated white of egg depends on the amount of surface exposed to the action of the pepsine. It is desirable, therefore, to present this substance to the action of the solvent in a finely divided condition; but in order that experiments may be comparable, this state of division must be more definite than that described as “in thin shavings.” It has been suggested by Mr. Dowdeswell (*Practitioner*, March, 1880) that the coagulated white of egg be pressed through wire gauze of 24 meshes to the inch; but as no mention is made of the size of wire used to produce this gauze, there is still room for discrepancy; the size of the mesh must depend on the size of the wire used in the manufacture of the gauze. I find that wire gauze composed of No. 32 Birmingham wire gauge brass or copper wire, and containing 36 meshes to the linear inch = 1,296 to the square inch, is as fine as can be conveniently used, and answers admirably. Hard-boiled white of egg thus divided is dissolved with great rapidity at the temperature named.

Much difference of opinion exists as to the degree of acidity most favourable to the digestion of egg albumen by pepsine, 0·1, 0·2 and 0·3 per cent. of real HCl. having been recommended by various experimenters. A mixture containing 1 per cent. by volume of strong hydrochloric acid answers very well, this is equal to about 0·3 per cent. of HCl.

E E

I find the following mode of procedure convenient. Having, for instance, six specimens of pepsine to test, 100 grains of the finely divided white of egg are placed in a small glass or porcelain mortar, and lightly rubbed with the pestle during the addition of 1 fluid ounce of the acidulated water; this is necessary to separate the particles which aggregate in lumps after being pressed through the gauze, and cannot be separated by stirring or shaking with the acidulated water. A glass mortar is preferable to one of porcelain, as the particles of white of egg show better therein and cannot be overlooked. The mixture is then poured into a test-tube 6×1 inches, a light stirrer, consisting of a piece of glass rod 7 inches long and $\frac{1}{8}$ inch diameter is inserted, and the tube is floated in the water-bath. Five other numbered tubes are charged in a similar manner. A beaker 7 inches high and 4 inches diameter, half filled with water, forms an excellent water-bath for the purpose, and admits of the ready examination of the contents of the tubes during the experiment. The tubes when charged will hang, self-supported, in an upright position, about $1\frac{1}{2}$ inch from the bottom of the beaker. A thermometer, in a similar test-tube, containing an ounce of water, should be placed in the middle of the beaker, and this will keep the six charged tubes in position against the sides.

A small Bunsen burner, or spirit lamp, should be used to heat the bath; and when the contents of the tubes and of the bath stand at 130° F., the specimens of pepsine, previously weighed or measured, should be added to the tubes, and stirred up. This stirring should be repeated at regular intervals, say every five minutes, and the temperature maintained at 130° F.

Two grains of an active pepsine, or the minimum dose of its preparations, should dissolve almost the whole of the white of egg in twenty minutes; the last few grains require a very disproportionate length of time for solution, but in thirty minutes they should have disappeared. In testing a number of specimens, however, it is seldom necessary to carry the process so far; in fifteen to twenty minutes, or even less time, it is easy to judge of the quality of the specimens under examination. A warm chamber, in which the temperature is maintained constant by a Page's or Reichardt's temperature regulator, may, of course, be used instead of a water-bath, and small beakers instead of test-tubes. I prefer, however, the arrangement described above,—the mixtures are more easily stirred, and the undissolved portions of white of egg are read off with greater accuracy, especially if the tubes be graduated from the bottom. There is no practical difficulty whatever in

maintaining a constant temperature for so short a time as that required. The little glass stirrers must not be omitted, as shaking cannot be substituted for stirring without leaving some of the particles of white of egg adhering to the tubes above the level of the liquid, where they will escape the action of the pepsine. A separate stirrer to each tube is necessary to prevent the accidental transference of particles of pepsine from one tube to another.

Operating in this way, pepsines may be tested in twenty minutes or half-an-hour with more accuracy than by the pharmacopœia process occupying four hours.

The finely divided white of egg may be kept ready for use by placing it in a wide-mouthed bottle, provided with a hollow stopper, in which a piece of sponge or a plug of cotton wool saturated with chloroform has been placed; the vapour of the chloroform diffuses through the contents of the bottle and preserves them from decomposition. The ordinary carbonate of soda bottle found in every chemist's shop answers the purpose perfectly.

I must apologise to the members of the Conference if I have appeared unnecessarily minute in describing a very simple process, but those who repeat the experiment will find that none of the details given are altogether unimportant.

NOTE.—Since the above paper was read, the author has observed that coagulated white of egg preserved in an atmosphere saturated with chloroform vapour, gradually becomes very much less digestible in pepsine solutions. For comparative experiments, therefore, he recommends the use of freshly boiled, and, if possible, new-laid eggs.

A vote of thanks was passed to the author.

Professor ATTFIELD said he could quite confirm M. Petit, Mr. Benger, and others who had noticed that pepsine acted more powerfully at a temperature of 120° or 130° than at 100° . At the same time it must be remembered that pepsine, when administered, had to do its work at about 95° or 100° , and therefore, it would seem to be important, besides knowing its maximum power, to know also its power, if that differed in any degree, at the normal temperature of the body. The suggestion with regard to the mode of dividing the albumen was a very good one, for when the success of an experiment depended on conditions, those conditions could not be too definitely stated.

Mr. SYMES, from a number of experiments on pepsine, had found that a temperature of about 120° was really the most favourable;

better than even a higher temperature. Professor Attfield, however, had anticipated a remark he was about to make, viz., that the authors of the B.P., knowing the temperature at which the pepsine would have to do its work, assumed that to be the best temperature at which to ascertain its real value. It would be well, therefore, to ascertain the following point. For instance, if out of a number of specimens one or more were found very active at 130°, he would suggest the repeating of the experiment at 100°, to see if the specimens most active at the higher temperature were also most active at that temperature; because, if this were not the case, they might easily be led astray by this mode of testing. He had also found a difficulty in getting the particles of albumen of uniform size without passing it through a sieve; and he also found that if left a short time before it was put into the acid water, a drying of the surface took place, which made it more difficult for the pepsine to attack it. It therefore seemed to him that the whole subject was so surrounded with conditions, that it was very difficult to lay down any absolute rule, and it really became a matter of experience, carefully testing a number of samples over and over again. He found also, that when the action on a solution had almost ceased, if more albumen were added to the peptone produced, it went on dissolving; thus, when 95 per cent. was dissolved, and 5 per cent. remained, if 50 grains more were added, the solution would go on more rapidly again, and it would continue to do so until there was but a small quantity of albumen left undissolved. The question as to the best means of carrying out the process seemed to be still an open one. He had found the thermal regulator of Reichardt, or that of Mr. Bengel, very useful for keeping the temperature constant.

Mr. M. W. WILLIAMS thought that if it was of importance to have the albumen evenly divided, it was equally important to insist on the state of division of the pepsin employed. He should imagine the albumen would be always used in a more or less finely divided state: but the state of division of the pepsin was not perhaps so much attended to. Again, hydrochloric acid was not universally admitted to be the free acid of the stomach; in all probability, judging from an analysis of the gastric juice, there was an excess of lactic acid over hydrochloric, as hydrochloric acid had a stronger affinity for bases than lactic acid, which would make lactic acid the free dissolving acid of the stomach. Possibly, therefore, it would be well to use lactic acid in these experiments, as well as a temperature of 100° F.

Mr. PLOWMAN asked if Mr. Bengel had experimented at all on

specimens which he knew to be impure, from admixture of starch or otherwise, and if so, whether there was any notable deficiency in the dissolving power of such samples.

Mr. CLEAVER said Mr. Bengel had not given any details as to the comparative values of the pepsines he had examined. He should like to know if he had found certain pepsines to be as valueless as they were sometimes represented; also if he had examined any of the liquid preparations which were supposed to be prepared without the aid of artificial heat in drying the pepsine, which many considered must tend to impair its value.

Mr. BENGER in reply to Professor Attfield's query whether the same pepsine which would rapidly dissolve white of egg at 120° was also the best at 100° , said he had frequently made that experiment, and he always found that the sample which acted most strongly at the higher temperature was also most powerful at the lower. Of course in the short time the experiment lasted the albumen was not converted into peptone, but was made soluble, the action being similar to that of diastase on starch, first converting it into soluble starch. It was simply a measure of the value of the pepsine. It was certainly the case, as Mr. Symes had said, that if an excess of albumen were present much more would be dissolved; for that reason it was preferable to operate on a small and definite quantity, rather than weigh the undissolved portion. If you put 100 grains in each of six tubes you could read off the undissolved portion, and get a much better idea of the relative strength than by using a larger quantity of white of egg and weighing the undissolved portion. He had examined many specimens of pepsine, and found some good, some very bad, and some of medium quality; there were all sorts of strengths in the market, but he had not given any results of that kind, because others had already done so. With regard to Mr. Williams's suggestion, it had always appeared to him that the active part of the pepsine dissolved very rapidly in the acid solution. The action began to take place immediately if you were dealing with any of the more active specimens. It did not appear to dissolve, but the active principle came out very rapidly. 122° was said to be the temperature at which pepsine was most active; but there was very little difference from 122° to 130° . He had adopted the latter, and fancied it was a little more active than at 122° , though the difference was very slight. He had tried various acids, but for experimental purposes hydrochloric seemed to be the best. Much more lactic acid was required, and the action was not so quick.

Mr. M. W. WILLIAMS remarked that hydrochloric acid seemed to have a tendency to form peptones itself.

Mr. BENGEE said he had tried experiments with fibrin, but it swelled up and became so gelatinous that it could not be used in this way; it could only be tested by a much longer process, viz., by seeing whether it would precipitate with nitric acid; with white of egg you could tell at once by the eye. As Mr. Symes had stated, pepsine lost some of its activity by drying; but when once carefully and thoroughly dried at a low temperature it did not appear to suffer further deterioration rapidly. He had examined specimens which had been digested in alcohol, in ether, in chloroform, and in benzol, and they had appeared almost as active afterwards as before.

Mr. SYMES said this was rather contrary to his experience. It was some ten years since he made some comparative experiments on pepsine in the moist and in the dry state, but speaking from memory he thought the activity was reduced by drying something like 30 per cent.

Mr. M. W. WILLIAMS thought if the active principle of pepsine diffused out so readily there must be an enormous loss in the usual method of preparing it, as the stomachs were well washed before being employed.

The next paper read was on—

COPYING INK FOR READILY TRANSCRIBING LETTERS WITHOUT A PRESS.

BY PROFESSOR ATTFIELD, F.R.S., ETC.

For the past thirteen years all letters, reports, etc., that I have written have been transcribed into an ordinary thin-paper copying-book with no more effort than is employed in using a piece of blotting paper. It has only been necessary to place the page of writing, note size, letter size, or even foolscap, in the letter-book, and use a leaf of the letter-book just as one would use a leaf of blotting paper. The superfluous ink that would go into blotting paper goes on to the leaf of the letter-book, and, showing through the thin paper as usual, gives, on the other side of the leaf, a perfect transcript of the letter. Any excess of ink on the page either of the letter or of the copying paper is removed by placing

a sheet of blotting paper between them and running one's hand firmly over the whole in the ordinary manner.

This ready transcription is accomplished, as will be anticipated, by using ink which dries slowly. Indeed, obviously, the ink must dry sufficiently slowly for the characters at the top of a page of writing to remain wet when the last line is written, while it must dry sufficiently fast to preclude any chance of the copied page being smeared while subsequent pages are being covered. The drying must also be sufficiently rapid to prevent the characters "setting off," as printers term it, from one page on to another after folding.

Now to manufacture ink that shall dry at the rate and in the manner just indicated, no matter what the size of the page of writing or how quickly or slowly it be written, no matter whether the air at the time be dry or moist, or the writing paper be unglazed, porous and absorbent, or highly glazed, close and non-absorbent, is impossible. Evaporation proceeds by laws which man can neither suspend nor hasten. Thin up-strokes written with any variety of ink inevitably dry quicker than the thick down-strokes written with the same ink, no matter what the wishes or requirements of the writer. Hence there are defects in my copying ink which are inherent and, I fear, irremediable. In short, probably no variation in the mode of manufacture of copying ink of this character would result in a writing fluid which could be used by all persons at all times under all circumstances. Still the ink has been of the greatest service to me myself, and should be equally useful to others. In purchasing writing paper, it is easy to avoid the excessively porous or the very highly glazed. On the exceptionally hot days of an exceptionally hot summer, when all ink dries with exceptional rapidity, it is not difficult to write somewhat more thickly than usual, and thus maintain the wetness of the words until a page is completed ready for copying. In very moist weather when the finished document written with this ink would not dry rapidly, and, therefore, would be liable to become smeared, it is not impracticable to use a fine pointed pen or to hold your sheet before a fire or over a gas flame for a moment or two. Lastly, the extreme facility with which letters are copied with this ink, and the great convenience attached to the advantage of possessing transcripts of letters, etc., are cheaply purchased at the price of a little care and practice in making one's up-strokes and down-strokes pretty much of a thickness.

But I am exaggerating difficulties. Processes, apparently practicable when described, often turn out hopelessly impracticable

when applied. Conversely, processes apparently impracticable often admit of ready application. My description of the use of my ink must, I am sure, convey an impression of impracticability. As a matter of fact, however, I use the ink from year's end to year's end without any trouble whatever. The case of this ink is one of those in which unavoidable disadvantages are compensated by an amount of personal carefulness to which one easily becomes habituated. The disadvantages, of course, preclude the introduction of the ink into indiscriminate wholesale and retail trade. The firm of manufacturers that, consulting me respecting copying ink, entertained my suggestion to use such an ink as this, went to the expense of provisionally patenting it in the hope that before the period of provisional protection elapsed it would be improved sufficiently to render it an ordinary commercial article. They have long abandoned that hope. I, too, have now abandoned it sufficiently to induce me to publish the mode of making and using the ink, in order that at least others may enjoy its use to the extent to which I enjoy it myself. The ink is really invaluable to me. To pharmacists, retail tradesmen, professional men, private persons and others who desire to keep copies of their letters and writings, but who do not write enough to render worth while the use of a copying book and copying press or the employment of a junior clerk or office boy for press copying, or who may desire to keep a private copying book, this ink will also prove invaluable. The ink can be made by chemists and druggists, who also might vend the article with no loss of dignity. For the sale of it would be accompanied by one of those little intelligent statements respecting mode of use and attendant conditions which come so naturally from the pharmacist.

I have only to add the process of preparation. The principle of the method consists in dissolving a moderately powerful hygroscopic substance in any ordinary ink. After experimenting on all such substances known to me, I give the preference to glycerine. Reduce, by evaporation, ten volumes of ink to six; then add four volumes of glycerine. Or manufacture some ink of nearly double strength and add to any quantity of it nearly an equal volume of glycerine.

The thanks of the Conference having been voted to Professor Attfield.

The PRESIDENT said that a variety of colours were used now for inks, and it was possible that some of the aniline colours might be

capable of use, in such a manner as Professor Attfield had now described.

Mr. WARD (Leeds) said he should imagine the action of glycerine on aniline ink would be much the same as on ordinary writing ink.

Professor ATTFIELD said this method answered perfectly well with coloured inks, as well as with black ink.

Mr. GERRARD remarked that a solution of eosine formed a very good red ink, but it did not run very easily. The addition of a little glycerine, however, would make it a first class red ink.

Mr. EGIN hoped no one would be led into using eosine for red ink, for though it produced a beautiful colour, it was very fugitive.

Mr. NAYLOR asked if Professor Attfield had examined copying inks, and if he had not often found them to contain glycerine. He knew some of them did so, though by no means in the proportion now described.

Professor ATTFIELD said he had examined many copying inks, and found that as a rule they contained some saccharine matter, but he had met with one or two containing glycerine in place of sugar. They were, of course, intended for use with a press, in the ordinary way.

The next paper read was a—

NOTE ON TESTS FOR NITRITES IN POTABLE WATER.

By CHARLES EGIN, F.C.S.

Attention has been called, first by Griess and more recently by Warington, to the extreme delicacy of the metaphenylene-diamine and naphthylamine tests for the detection of nitrous acid. The metaphenylene-diamine test gives a distinct reaction in a solution of one part of nitrogen as nitrous acid in 1,000,000 parts of water and the naphthylamine test will detect with ease one part in 100,000,000 and with care as little as one part in 1,000,000,000.

I was curious to learn how these tests compared with the old-fashioned potassium iodide and starch test, and the results of my trials I thought of sufficient interest to bring before the Conference. I found that a solution in water of one part per 1,000,000 of nitrogen as nitrous acid gives instantly a blue colour which rapidly darkens to a blue black. One part in 10,000,000 gives a distinct blue in a few minutes, which gradually deepens. One part in

100,000,000 gives a distinct blue in twelve hours, and one part in 1,000,000,000 in forty-eight hours, and by allowing the solution to stand some days it is possible to detect even smaller quantities than this. As the naphthylamine test has been recommended as being so much more delicate than any known up to the present, it is evident that the at all events equal delicacy of the potassium iodide test has never been suspected. I need hardly say that the solutions I experimented on were kept out of contact with the air in stoppered bottles and that blank experiments were made with the reagents in water free from nitrous acid.

One word as to the significance of the presence of nitrous acid in spring and well waters. I cannot help feeling strongly that the importance of the estimation of nitrites is not sufficiently realized. The Rivers' Pollution Commissioners gave in their analyses the amount of nitrogen as nitrates and nitrites, but gave no separate estimation of nitrites; and the Society of Public Analysts, which has recently sent out instructions to public analysts throughout the kingdom as to how they should return their results in water analysis, omits nitrites from its schedule altogether.

Now, the presence of minute quantities of nitrates and ammonia has absolutely no significance in water-analysis, inasmuch as they are sometimes found alike both in good and bad waters; but it is very different with nitrous acid, which is formed during the process of nitrification, whilst the fermentation is going on, and is evidence of the presence in a water of fresh decomposing sewage.

Whether we consider, then, the important evidence the determination of nitrites affords and the infinitesimal quantities that can be detected, surely it is one of the most important items we can take note of. I have never known a well or spring water containing nitrites that was not proved to be unfit for drinking purposes, and on the other hand, no water which is known to be unpolluted has even yielded a trace of nitrites. As a matter of course, however, I do not advocate that the evidence afforded by any one item in water analysis should be considered as absolute.

What I have said applies specially to well and spring waters. I am not sure how far it applies to river water. There is a notion that under the influence of vegetation the nitrates when present in river water may be partially, if not wholly, reduced to nitrites; but though, to settle this point for my own satisfaction, I have frequently examined water containing a small proportion of nitrates, from uncontaminated brooks and rivers in which aquatic vegetation was abundant, I have never detected the presence of nitrites. I do not

forget that rain water will sometimes contain enough nitrous acid to give a reaction with even the metaphenylene-diamine test, and one might reasonably suppose that open waters, such as rivers and waters stored in reservoirs, should give evidence of its presence. As a matter of fact, however, notwithstanding repeated trials with unpolluted waters, I have never found this to be the case.

A vote of thanks was passed to Mr. Ekin.

The PRESIDENT said it was certainly a matter of great practical importance to be able to discover the presence of nitrites or nitrates in water. Mr. Ekin appeared to have taken a very sound position with regard to the great danger of passing over the presence of nitrites, or confusing them with nitrates, as some authorities had done; and at the same time he appeared to be thoroughly justified in the belief that vegetable growth was not capable of reducing nitrates into nitrites. He himself believed that the presence of nitrites was one of those warnings which should render one very cautious in accepting a drinking water as fit for use.

Mr. M. W. WILLIAMS said it was new information that the old iodide of potassium and starch test was more delicate than these recently invented tests. He had examined this matter himself, and had made a good many determinations of the amount of nitrous acid in water by means of the metaphenylene-diamine test, and from his own experiments he certainly should have said that the metaphenylene-diamine, although it fell short of the naphthylamine, was itself more delicate than the iodide of potassium and starch test; but after hearing the paper he had begun to doubt the conclusions to which he had come, since it appeared that Mr. Ekin kept this iodide of potassium and starch solution for twenty-four hours or more, which was an experiment he had not tried. On the other hand, it must not be forgotten that iodide of potassium and starch in an acidulated solution, when exposed to air and to other agents, had a great tendency to become coloured. Every one who was in the habit of titrating iodine by means of hyposulphite of soda knew that when the solution had been decolorized, if it were allowed to stand, for a time, for some reason—hitherto, he believed, unexplained—the colour returned, at first very faintly, but afterwards it became blue. From his present information, he should certainly think the subject required further working at before coming definitely to the conclusion that the change mentioned really did indicate the action of nitrous acid. He would not venture for a moment to dispute the statement that the presence of nitrous acid indicated recent

sewage contamination, because it showed there must have been a certain quantity of nitrites present. Now, when sewage underwent decomposition, the first product was that the nitrogen of the albuminous matter remained as ammonia; after that the ammonia passed by some kind of action on the semi-putrid mass into nitric acid; it was only very recent sewage, which had not undergone putrefaction to ammonia, which caused the production of nitrous acid. This was a most important point. If the albuminoid matters had already undergone putrefaction, and become converted into ammonia, it would mean that the contamination was more remote than was the case where nitrites were found. A short time previously he analysed the water of a well in the chalk, near Basingstoke, in which he found as much as .5 of nitrous acid in 100,000 parts. Chalk waters usually contained a very small amount of organic matter, because of the large mass of porous chalk through which they had been filtered, and he found this water contained very little more than the average amount of organic matter, yet he ventured unhesitatingly to say from the amount of nitrites that there was probably a source of sewage contamination within 100 yards. The proprietor had the well pumped out and explored, and five or six cesspools were found in the immediate neighbourhood which drained into the well.

Mr. J. WILLIAMS thought the question principally dealt with by the last speaker was hardly the one before the meeting, which, as he understood it, was the extreme delicacy of the iodide of potassium test as compared with the metaphenylene-diamine test. He would, however, point out a source of error, which might have misled Mr. Ekin in forming an opinion of the extreme delicacy of iodide of potassium in the presence of nitrites. Of course iodide of potassium itself was very seldom absolutely pure; it might contain iodate. But even supposing Mr. Ekin had taken great pains to prevent the presence of iodate, another source of error existed, which many chemists overlooked. It was in the hydrochloric acid. This acid nearly always contained free chlorine, and when speaking of tests of this extreme delicacy it must be remembered that the quantity of hydrochloric acid used was a considerable amount in comparison to the supposed quantity of nitrites present, so that something might be really added which would eliminate iodine and give a fallacious test. It was so difficult to obtain hydrochloric acid perfectly free from chlorine, that manufacturers often got blamed for the impurity of iodide of potassium, when the real fault was with the hydrochloric acid.

Mr. EKIN remarked that he always used acetic acid.

Mr. SIEBOLD said if he had understood aright there was no fear of any mistake having been made, such as Mr. Williams suggested was possible, as side by side with his experiments Mr. Ekin had made blank experiments. If the iodide of potassium contained iodate, the result ought to be the same with the blank experiment as with the other. Mr. Ekin had just remarked that he used acetic acid, and in connection with that he would point out that it had been shown by Fresenius that with dilute sulphuric acid the test was of much greater delicacy than with acetic acid. He recommended acetic acid for the liberation of nitrous acid in those cases in which the extreme minuteness of its proportion rendered it desirable to concentrate it by distillation; but for the test itself, no matter whether it was applied to the distillate or direct to the water, sulphuric acid was much to be preferred. The liberation of nitrous acid from nitrites was as completely effected by acetic as by sulphuric acid, but not so the liberation of hydriodic acid from the potassium iodide; and it was the reaction between the liberated nitrous and hydriodic acids upon which the delicacy of the test depended. Using sulphuric acid, he had often obtained an almost instant coloration where, owing to the minuteness of the traces of nitrites, the application of acetic in the place of sulphuric acid gave either an entirely negative result or yielded a coloration only after a considerable time. But under all circumstances the simultaneous performance of a blank experiment, to guard against error, was an essential condition.

Mr. CLEAVER said pharmacists were often called upon to pronounce upon the fitness of water for drinking purposes. The metaphenylene-diamine test furnished them with a ready means of determining, with comparative accuracy, the amount of nitrous acid in water, but the test now brought forward seemed to be superior to it as regards delicacy.

Mr. NAYLOR thought it had been shown that the iodine might be set free by some impurity contained in the acid used. With reference to the remarks made by Mr. Siebold, he had always used sulphuric acid, as sometimes the nitrous acid would not be set free for some time if acetic acid were employed. He understood Mr. Ekin to state that he had never found water containing nitrites which did not produce bad effects when taken; he had always condemned such waters himself, but still he must say he often found that they were constantly drunk with apparent impunity.

Mr. GROVES asked if Mr. Ekin were quite sure that the elimina-

tion of iodine and the blue coloration was not sometimes due to the presence of iron in the ferric state. The ammonia which descended in rain-water became oxidized to nitric acid in passing through the soil. But was there not an intermediate state before it became fully oxidized, which might account for the presence of nitrous acid?

Professor ATTRFIELD said he had always been in the habit in making analyses of water to test for nitrites, and he quite agreed that it was very important to determine their presence. He also agreed with Mr. Ekin, in thinking that the iodine and starch test was as good as any of the substitutes. He had tried those proposed from time to time, very carefully, though only qualitatively, and had come to the conclusion that the starch test was as good as any of them. He had never made quantitative experiments such as Mr. Ekin had now carried out. With regard to the significance of nitrites or nitrous acid in water, there could be no doubt, from the statements of many experimenters, that as a rule they did indicate the presence of contamination by recent sewage. Mr. Ekin was not quite certain whether this was so in the case of river waters; he had not much experience in that direction, but he thought he might say that nitrites were occasionally found in very deep-seated springs, where one could scarcely imagine that there was any organic matter. He had also found them in some very deep chalk well waters, such as the celebrated Trafalgar Square well water—though not in that particular one—waters, which contained a considerable quantity of alkaline salts, chlorides, sulphates, carbonates, and ammonia. He need not say that in all cases where there was any doubt of the purity of the iodide of potassium, blank experiments should be made. With respect to the reduction of nitrates to nitrites by organic matter, he would recall to the members a remark made by the late Mr. Deane, who, on one occasion, found that some very concentrated infusion of senna on being slightly acidified gave off abundance of nitrous fumes. It was known that nitrate of potassium was in the senna. That would seem to be a case of reduction by organic matter.

Mr. A. C. ABRAHAM remarked that in the old source of the Edinburgh water, which was chalk,* there was a considerable quantity of nitrates and nitrites, but no organic matter whatever.

Mr. SCHACHT said that on this subject Mr. Ekin was most properly regarded as an authority, not only in that room, but in the whole

* In reply to a question by Mr. Ekin, this was subsequently explained to be an old chalk bed.

chemical world, and anything he told them on the question of nitrites in well water they must be grateful for. He, personally, having had some little experience in the estimation of well waters, could not help feeling especially grateful for the caution he had exercised in indicating his opinion on the side issue raised as to the relevancy of the presence of one or other single ingredient in a potable water. He was very glad to hear him say that too much stress must not be laid on the presence of one single ingredient, and hearing that, he asked to make an observation on one sentence which did not seem quite so cautious as the rest of the paper. He understood Mr. Ekin to say that, comparatively speaking, he should attribute no importance to the presence of nitrates in water; but he should suppose that if he found nitrates and chlorides to any considerable extent, the absence of nitrites would not deter him from condemning that water as being very probably contaminated by sewage.

Mr. EKIN in reply, said he little thought ever to be charged with not laying sufficient stress on the presence of nitrates; on the contrary, he was more accustomed to be laughed at for laying undue stress upon them. What he said was that very *minute* quantities of ammonia and nitrates were to be found in both bad and good waters. With reference to the particular spring to which Professor Attfield referred as containing nitrites, so convinced was he that the water must be contaminated, that if the locality were indicated he would not mind travelling 200 or 300 miles to investigate the surroundings of the spring, to settle the point. As to its containing no organic matter, of course the Professor could only have been speaking relatively, because there was no such thing as water without organic matter, and with regard to ammonia, its absence was not the slightest indication of purity, as it was frequently the case that the very worst waters, especially shallow well-waters, were absolutely free from ammonia. Mr. Williams seemed to think the metaphenylene-diamine test the best. It was very delicate and reliable if proper pains were taken, only it was difficult to distinguish between the brown colour of very dilute solutions and the brown colour of peat waters. As Mr. Williams had very properly said, it was liable to precipitate, except in very dilute solutions, which was a drawback to any colour test; but that might be got over by redissolving the precipitate and making use of it to dye white floss silk, and being guided by the depth of tint. Of course, constant quantities of water and equal weights of silk must be taken to get comparative tests, and it was surprising the marked

difference in colour that a very slight difference in strength would make. Mr. Siebold had already answered one objection by pointing out that he had always made blank experiments, so that the objections Mr. John Williams raised would not apply. Mr. Siebold spoke positively about the difference of sulphuric and acetic acid; he had used them side by side, and had not observed it. He used glacial acetic acid in pretty large quantity. Another gentleman said he had known cases where people had drunk bad waters with apparent impunity for years. Every one who had to condemn water was accustomed to have this brought forward as an argument that the analysis must be wrong. People, old ladies especially, seemed to take it as a personal insult when told that the water they had been drinking for years was bad. He decidedly thought, and he did not know that there was any doubt of it, that nitrites were an intermediate stage between ammonia and nitrates. Some years ago he percolated sewage through soil, but could not set up nitrification. Since then it had been ascertained that nitrification was not a mere process of oxidation, but rather one of fermentation, and he had repeated his experiment, using soil that had been in contact with sewage a long time, with the result that the ammonia of the sewage was oxidized to nitrites first and finally to nitrates. Having referred to the paper in the *Pharmaceutical Journal* on bacteria investigation, by Marpmann, which pointed out that where nitrous acid was present in water, micrococci were also detected, and that the water should therefore be avoided, Mr. Ekin said that Mr. Groves had a very troublesome knack of putting his finger on the weak spot, and he was afraid he had done so on the present occasion. He should think it possible that waters containing iron might interfere with the potassium iodide test for nitrous acid.

The next paper read was a—

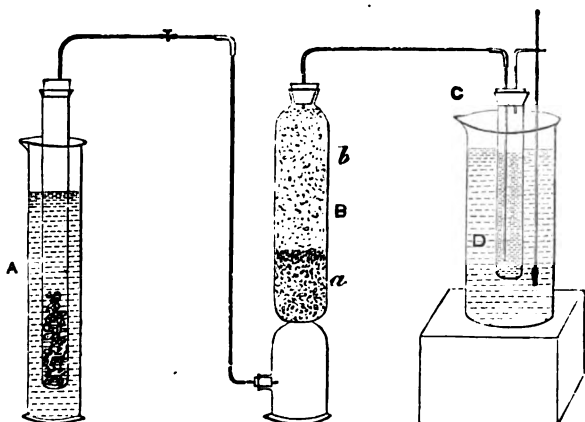
NOTE ON THE SOLUBILITY OF CARBONIC ANHYDRIDE IN CERTAIN AROMATIC WATERS.

By C. H. BOTHAMLEY,

Assistant Lecturer in Chemistry, Yorkshire College.

It has been stated that carbonic anhydride is more soluble in peppermint water than in pure water. The experiments described in this note were undertaken with a view to ascertain whether this is really the case, and whether the property is common to other

aromatic waters. The method of experiment was as follows:—A current of pure and dry carbonic anhydride was passed continuously for several hours into a measured quantity of the water contained in a large test tube. The test tube was placed in a large beaker full of water, the temperature of which was indicated by a thermometer suspended in it. The arrangement of the apparatus is shown in the accompanying sketch.



- A. Continuous carbonic anhydride apparatus.
- B. Drying tube filled partly with copper sulphate (*a*), partly with calcium chloride (*b*).
- C. Tube containing the aromatic water.
- D. Beaker containing water at a known temperature.

At the commencement of each experiment the temperature was about 16°C ., but it was allowed to rise to 17.5°C ., and was kept constant at this point. After the gas had been passed into the liquid for several hours, the apparatus was disconnected, the carbonic anhydride expelled from the upper part of the test tube, the water transferred to a flask containing ammoniacal calcium chloride solution, and the flask tightly corked. After standing overnight, the liquid was rapidly filtered with as little exposure to air as possible, and, after washing, the precipitated calcium carbonate was dissolved in a measured quantity of normal hydrochloric acid, and the excess of acid determined by means of standard alkali. From the amount of calcium carbonate precipitated, the volume of carbonic anhydride dissolved in the water could, of course, be readily calculated.

In these experiments I have used, instead of the ordinary solution

F F

of sodium hydrate, a half-normal solution of ammonia, as recommended by Fleischer. It can be easily obtained in a state of purity, does not readily take up carbonic anhydride from the atmosphere, and does not deposit any flocculent precipitate similar to that which usually makes its appearance in solutions of sodium hydrate. In consequence of its freedom from carbonic anhydride, the exact point of neutralization is more sharply defined than with ordinary caustic soda, but, as Fleischer directs, the solutions titrated must be cold. Although the experiments were made during the hottest part of last July, and the bottle containing the standard ammonia was frequently opened, its strength showed no appreciable variation. The hydrochloric acid employed was titrated by means of pure calcium carbonate, a method more rapid and at least as accurate as precipitation by silver nitrate.

The results obtained were as follows :—

Peppermint Water.—Prepared from the English oil, without distillation. Specific gravity at 18° C., compared with water at the same temperature = 1·0001.

| | I. | II. | III. |
|--|------------|---------|----------|
| Duration of gaseous current | 2 hours | 6 hours | 5 hours. |
| CO ₂ dissolved by 100 c.c. of | | | |
| water | 95·911 | 93·478 | 94·917 |
| Mean = | 94·77 c.c. | | |

Cinnamon Water.—Distilled from the bark, sp. gr. 18° C. = 1·0002.

| | I. | II. |
|--|-------------|----------|
| Duration of gaseous current | 4 hours | 6 hours. |
| CO ₂ dissolved by 100 c.c. of | | |
| water | 99·71 | 103·16 |
| Mean = | 101·48 c.c. | |

The addition of dilute ammonia solution to the cinnamon water produced a distinct yellow coloration, and on addition of calcium chloride a precipitate was formed, although no carbonic anhydride had been passed into the liquid. This precipitate consisted of some organic compound, and dissolved slowly in dilute hydrochloric acid.

Dill Water.—Distilled from the seeds. Its specific gravity at 18° C. did not differ to an appreciable extent from that of pure water.

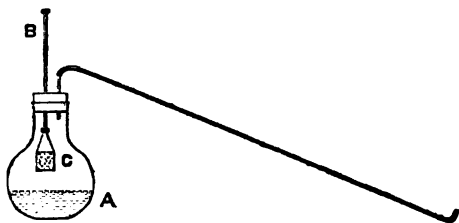
| | I. | II. |
|--|------------|----------|
| Duration of gaseous current | 6 hours | 4½ hours |
| CO ₂ dissolved by 100 c.c. of | | |
| water | 97·48 | 97·71 |
| Mean = | 97·57 c.c. | |

The following table gives the volume of carbonic anhydride, measured at 0° C. and 760 mm., dissolved by 100 volumes of the different aromatic waters at 17.5° C. (63.5° F.):—

| | Sp. gr. | Vols. CO ₂ Dissolved. † |
|-----------------------|---------|------------------------------------|
| Distilled water . . . | 1.0000 | 94.19 |
| Peppermint water. . . | 1.0001 | 94.77 |
| Dill water . . . | 1.0000 | 97.57 |
| Cinnamon water . . . | 1.0002 | 101.48 |

From these numbers it is evident that carbonic anhydride is slightly, but only slightly, more soluble in the three aromatic waters taken than the water. Whether the differences are greater under high pressures has not been determined.

I was informed that when equal weights of citric acid are dissolved in distilled water and peppermint water respectively, and an excess of sodium bicarbonate added to each solution, there is apparently a greater evolution of gas in the first case than in the second. In order to determine whether this is really the case, I adopted the following plan:—A flask, A, of about four ounces capacity, with a short wide neck, was fitted with an indiarubber cork pierced with two holes, through one of which passed a bent delivery tube, whilst the other carried a glass rod, B, from the end of which was suspended a small glass cup, C. The rod was lubricated with glycerine, in order that it might slide easily, and thus the small cup, which was filled with sodium bicarbonate, could be lowered into the liquid in the flask after the apparatus had been fixed in position.



In the flask were placed 5 c.c. of normal hydrochloric acid diluted with 15 c.c. of pure water or 15 c.c. of one of the aromatic waters, as the case might be. The gas given off when the sodium bicarbonate was lowered into the dilute acid was collected in a graduated tube and carefully measured. The results obtained

are given in the following table, each number being the mean of at least two concordant observations :—

| | Gas given off. |
|--|----------------|
| 5 c.c. HCl + 15 c.c. distilled water . | 78.40 c.c. |
| „ + 15 c.c. peppermint water . | 83.15 c.c. |
| „ + 15 c.c. dill water . | 79.98 c.c. |
| „ + 15 c.c. cinnamon water . | 80.52 c.c. |

Since carbonic anhydride is slightly more soluble in aromatic waters than in pure water, we should expect more gas to be given off when the hydrochloric acid is mixed with the latter than when mixed with the former, but the reverse is the case. In the entire series of experiments the lowest quantity of gas given off when the acid was diluted with an aromatic water was greater than the highest quantity given off when the acid was diluted with distilled water. Similar results were obtained when citric acid was used instead of hydrochloric acid. In all cases when the acid is mixed with an aromatic water and sodium bicarbonate is added, the evolution of gas is less tumultuous than when distilled water is used, and this fact has probably led to the supposition that a considerable quantity of the gas is retained by the aromatic water. The experiments just described show that this is not really the case.

A vote of thanks was passed to the author of this paper.

The PRESIDENT said that the style of this paper must have gratified the meeting very much, as there was such a cautious tone throughout the whole of the observations, that entitled them to place confidence in whatever results were reported; and as this was a subject which had been on the blue list for some time, and about which no one had been able to offer definite evidence, it was very satisfactory that it had now received a final solution. It was doubly pleasing to him to hear this paper, it being a contribution from one of those schools of which he had ventured to speak earlier in the day, and he hoped that in the future there would be an emulation amongst such schools as to which could do the best for the Conference. If the eleven towns and cities of which he spoke in the morning were each to send papers, their successors might have to divide into two or three sections in order to get through the work.

Mr. SIEBOLD said when engaged in business as a pharmacist in Germany he never doubted for a moment that carbonic anhydride was considerably more soluble in peppermint water than in plain water, because he had had many illustrations of the fact in the dispensing of effervescing mixtures. Whenever peppermint water was used in such mixtures the disengagement of the gas was much

less tumultuous than when the same mixture was made with plain water. This fact, moreover, was well known to many others, and was, he believed, mentioned in several text-books. German physicians often prescribed peppermint water for effervescing mixtures with the special object of retaining more of the gas than plain water could retain. The peppermint water he had been in the habit of using in Germany was distilled from the herb, while that used by the author of this paper was made from the oil without distillation, and this difference might possibly account for the discrepancy. He was rather surprised now to learn that, with regard to this subject, he, and many others with him, had all along been labouring under an illusion; but, seeing that the result of one set of the author's experiments seemed to be in direct contradiction with that of the other, he would prefer to repeat the experiments before adopting such a conclusion.

Mr. A. C. ABRAHAM asked whether the dissolved air was eliminated before these estimations were made.

Mr. EKIN said he was going to ask the same question, which had an important bearing on a branch of the business which chemists sometimes had to do with, namely, the making of soda water. It was well known that if the atmospheric air were driven off from the water by charging it with carbonic acid and then blowing that off, much more carbonic acid would be dissolved than would be the case otherwise, and the soda water became more pungent. The author said his comparisons were with pure water, and he presumed he meant distilled water, which of course would be free from atmospheric air, just as much as distilled aromatic water.

Mr. SIEBOLD remarked that in peppermint water made by distillation there would be less air than in that made by shaking water with peppermint oil.

Mr. CONROY remarked that the author did not say how the peppermint water was made. He did not know how it could be made except by distillation, unless it was by dissolving the essential oil in the water by agitation, and then it would not be the peppermint water of the Pharmacopœia. He noticed that the density of the peppermint water was greater than that of distilled water, which seemed strange, because the specific gravity of oil of peppermint was less than that of distilled water. It seemed as if there was some mistake there. The density of cinnamon-water was also given as 1.0002; but oil of cinnamon was heavier, therefore that might be so. Probably if the experiment had been conducted under pressure the result would have been different.

Mr. CLEAVER said whether the peppermint water were made by distillation or from oil, the carbonic acid ought to be dissolved to the same extent, if the peppermint had anything to do with it. Some years ago, when engaged in making large quantities of peppermint water by rubbing up a little in magnesia and afterwards filtering, he perfectly remembered there was a considerable magnesia deposit on the bottom of the vessel containing the water. He did not examine it at the time to see whether it was carbonate of magnesia; he had no doubt it was, and that might be some little evidence for Mr. Bothamley to look to in future.

Mr. SYMES said if the peppermint water was not prepared by distillation it would, he presumed, be prepared, not by rubbing with magnesia, which was a very old method, but by agitation, and, therefore, he was inclined to think there was some importance in the question put by Mr. Abraham, and that the result was largely dependent on the amount of air present. Mr. Ekin had called attention to the fact, which was well known, that soda-water makers blew off the air before the carbonic acid was introduced; now if this sample of peppermint water were made by agitation it would necessarily contain a large quantity of atmospheric air, and to get accurate results it would be far better that it should be prepared by distillation.

Mr. BOTHAMLEY in reply said he should certainly have been led to suppose from the evolution of gas when sodium bicarbonate and acid were dissolved in peppermint water, that some of the gas was retained, but the actual measurements showed this was not the case, and, moreover, several experiments gave concordant results. Of course his experiments were not made under high pressure, or even in an extra half atmosphere. He was inclined to think that possibly more gas would be retained, in the latter case, because certain properties of the peppermint water led him to suppose it had considerably greater surface tension than pure water, and that might, to some extent, cause it to retain a considerable quantity of gas driven into it by pressure. As to the question whether the air was eliminated, the only way in which, as far as he could see, that could be done was by passing the gas through for a sufficient length of time; and the carbonic anhydride was passed through for different times, varying from three to six or seven hours, so that in all probability most of the air would be eliminated. The peppermint water was simply made from the oil by agitation. The specific gravity of peppermint water he thought must certainly be above that of pure water, because the difference was too great to be simply due to

error of experiment. That might be due to the fact that the water was not perfectly transparent, and, in fact, being made by agitation it was not perfectly clear. As to the point whether there was carbonic anhydride in the water already, he was careful to ascertain that by mixing the aromatic water with ammonia and calcium chloride in all cases. In the case of dill and peppermint water there was the merest trace of a precipitate of calcium carbonate; cinnamon water gave a considerable precipitate, but that did not contain any carbonic anhydride. Therefore he felt justified in concluding there was no sensible amount of carbonic anhydride already present in the waters.

Professor ATTFIELD asked if Mr. Bothamley had speculated on the cause of the increased solubility of carbonic anhydride in these waters. Carbonic acid was soluble in oils; but, probably, that did not affect this case.

Mr. BOTHAMLEY said the only reason he could assign was the greater surface tension.

The next paper read was a—

NOTE ON OXIDE OF ZINC.

By R. F. REYNOLDS.

The question proposed was to ascertain what amount of sulphuric acid existed in some samples of oxide of zinc, as used in pharmacy.

About 17 grams of the oxide wasedulcorated with hot water, and the filtrate after careful concentration was treated with barium chloride, and any resulting barium sulphate was estimated in the usual way.

Experiment No. 1.—Oxide of Zinc, Hubbuck's.—This gave no trace of sulphuric acid.

Experiment No. 2.—Oxide of Zinc, "X.X."—The preliminary qualitative examination showed that sulphuric acid in combination was clearly present. 17.2877 grams of zinc oxide gave sulphuric acid equivalent to 2.455 per cent. of anhydrous zinc sulphate (ZnSO_4).

The makers of this sample alleged that it was prepared by the combustion of the metal.

Assuming this statement to be accurate, the metal would appear to have been in an impure condition.

The result of attempts to prepare a pure zinc oxide by precipitation have been published in various numbers of the *Pharmaceutical*

Journal from time to time. The most important contributions to our knowledge on these points have been made by Professor Redwood and the late Mr. Stoddart.

Professor Redwood found that the oxides of zinc of commerce, at the period when his paper was published, in 1872, "were either basic carbonates or basic sulphates containing only from 64 to 67 per cent. of oxide," and Mr. Stoddart met with a sample containing 9.13 per cent. of sulphite and also a trace of sulphate of zinc.

The following experiments were undertaken with a view of obtaining additional information on this subject:—

First.—100 grams of crystallized zinc sulphate were dissolved in 300 c.c. of water, and 110 grams of crystallized carbonate of sodium dissolved in 300 c.c. of water. The zinc solution was slowly filtered into the solution of sodium carbonate, which was kept boiling and well stirred. A protracted washing of the precipitate was continued for some days, until no trace of alkali was shown by litmus paper. After drying, the zinc carbonate was tested for sulphuric acid, and gave distinct evidence of its presence. After conversion into zinc oxide by heat, tests gave the same result.

Second.—50 grams of crystallized zinc sulphate were dissolved in 600 c.c. of water, and 200 grams of crystallized carbonate of sodium dissolved in 400 c.c. of water.

They were mixed as in experiment 1, and the precipitate was washed with equal care.

The zinc carbonate thus prepared yielded much smaller traces of sulphuric acid than in the previous case.

The use of a large excess of carbonate of sodium evidently produces a marked effect in the completeness of the decomposition.

The operation of filtering so bulky a precipitate is very tedious, and this is a case in which the filter-press should prove a valuable auxiliary.

By the use of a relatively large quantity of alkali and the employment of a filter-press, a practically pure product could doubtless be obtained.

But the great purity of Hubbuck's oxide is a strong recommendation of the process of combustion, and with such a standard of purity within our reach, it is to be hoped that if the oxide should be prepared by any other means, it will not be accepted if less pure than Hubbuck's product.

The above experiments were made in the laboratory of the Yorkshire College.

A vote of thanks having been passed to Mr. Reynolds, the PRESIDENT said he should like to hear any suggestions as to where the sulphuric acid came from in the sample which was alleged to be made by combustion. The impurity of the metallic zinc might account for the presence of sulphur, but it had been stated that the calcination of sulphide and various salts of zinc had been sometimes adopted in order to obtain the oxide by what was called combustion.

Mr. SCHACHT remarked that the scope of the paper scarcely gave much opening for discussion. He should like, however, to make one personal remark—viz., that it would be a great gratification to himself, if he occupied that chair, to find his son bringing forward such a paper, and he could not help congratulating both the President and the author on the paper he had read, more particularly as he had taken occasion to give them all a caution as to the desirability by one process or another of getting the purest possible article which could be obtained.

Mr. BOTHAMLEY said that with regard to the sulphur in the sample of zinc referred to, of course the combustion of zinc required to be aided by some extraneous heat; if a gas furnace were used, it was not at all difficult to account for the presence of the sulphur, because most samples of gas contained sufficient sulphur to render its presence perceptible in an oxide of zinc. When substances such as carbonate of soda were heated over a Bunsen burner, they soon showed traces of sulphates derived from the sulphur in the gas.

Mr. CONROY was not quite certain whether the sample referred to was a commercial one. He had examined many samples within a year or two and rarely found them contaminated. Moreover, the oxide of zinc was very bulky and highly porous, and would thus offer a large surface for the absorption of the products of combustion of the coal gas with sulphuric acid. There were plenty of commercial samples in the market quite equal to Hubbuck's in purity.

Mr. SIEBOLD said the presence of this impurity should remind them how often chemicals were impure to an extent little anticipated. There was a large field for the rising generation of students to work upon in this direction. It was sincerely to be hoped that the example set them by Mr. Reynolds would be followed by a large number of others. Now-a-days, when so many chemists were engaged in the pursuit of organic chemistry, inorganic chemistry was somewhat neglected.

The next paper read was a—

NOTE ON SULPHATE OF BEBERIA.

By D. B. DOTT.

It was my intention to have ready for this meeting of the Conference a paper giving an analysis of the so-called sulphate of beberia, but as I have not yet been able to complete all the requisite experiments, the communication must be postponed to another occasion. In the meantime, however, I thought it might be of some interest to send this note containing a general description of the Pharmacopœia preparation, especially as statements of a misleading tendency have at various times been published regarding the same.

The commercial sulphate of beberia is not a definite salt, but a purified extract of greenheart bark. It contains about 15 per cent. of water (lost at 110° C.), and 7.80 per cent. of SO_3 , which is equivalent to 68.8 per cent. of beberia hydrate. The percentage of beberia is not, however, nearly so great as that, a large proportion of the SO_3 being combined with other alkaloids capable of neutralizing acids. It is extremely difficult to determine exactly the amount of beberine present in the mixture. This arises principally from the amorphous nature of the alkaloids, and the impossibility of getting the hydrochloride to crystallize unless nearly pure. Although we do not know the exact amount of beberia in the "sulphate," there is good reason to believe that the proportion is much higher than that indicated by Professor Flückiger (*Pharm. Journ.* [2], xi., 193), whose method of purifying by repeated precipitation with potash is attended with serious loss, on account of the solubility of the base in the alkaline lye. In any case it is certain that there are present in the commercial article, alkaloids capable of neutralizing acids, amounting to about 60 per cent. of the preparation, and that they all contribute to its value as a tonic is more than probable. Indeed it is doubtful whether a much better preparation of the bark could be obtained than the Pharmacopœia "sulphate," at least with our present knowledge of its chemistry. At the same time it would be advisable to alter the name, which does not indicate the real nature of the substance, the expression "sulphate of beberia" properly applying to a compound of definite chemical composition.

A vote of thanks was passed to Mr. Dott.

The PRESIDENT, before adjourning the meeting for the day, said

the members present would have observed in the *Pharmaceutical Journal* an allusion to the title of a paper on pharmaceutical remuneration by Mr. Proctor, of Newcastle. They all knew how well Mr. Proctor wrote on any subject, and it was not surprising that a wide feeling of interest should have been excited by this announcement. It might also be recollected that the Editor of the *Pharmaceutical Journal* alluded to this paper as being somewhat special and rather out of the ordinary line of papers to be expected at the Conference, and perhaps its very novelty might have excited a little unusual interest. This paper, however, was not on the programme, and he wished to explain, on the part of the Executive Committee, that there was no breach of faith on the part of any one in this respect. The Editor of the Journal very kindly gave, as a matter of public information, a statement of what papers had been offered to the Executive Committee; he could not do more than that; he could not and did not state that they had been accepted, for the very sufficient reason that the Executive Committee had not had a meeting. A very large meeting of the Executive, larger than he had ever remembered, was held on the previous evening, and the question of the papers offered was one of the most important parts of its business. The paper to which he had alluded was considered with others, and a discussion took place whether it should be introduced and whether such a discussion as it was felt would be the necessary consequence of such a paper being read should be a part of the business of that Conference. The members of the Committee very calmly and deliberately came to the conclusion that they could not consistently with their duty recommend that the Conference should discuss this paper. Whether they would be fortunate enough to give satisfaction by that decision he did not know, but it was come to unanimously by a number of gentlemen representing different parts of the country, and that was perhaps all that he need say, except that on representing to Mr. Proctor the feeling of the Executive Committee, that gentleman immediately said he should be glad to meet their views by withdrawing the paper and laying it before the public in some other form.

MR. PROCTOR said he had been asked to read a paper, and that happened to be the only subject on which he felt prepared to write. He wrote the paper and submitted it to the Executive, and all he wished was that there should be no feeling whatever that he had broken faith with the Committee.

The Conference then adjourned.

Wednesday, August 31.

The Conference resumed at half-past ten o'clock, when the reading of papers was further proceeded with, the first paper being a—

NOTE ON SOME SAMPLES OF JAMAICA-GROWN JALAP.

By THOMAS GREENISH, F.C.S.

In July of this year (1881), Mr. D. Morris, Director of the Botanical Gardens, Jamaica, sent to Mr. Holmes, for the Museum of the Pharmaceutical Society, samples of the official jalap, *Exogonium purga*, cultivated in that island. One sample consisted of small tubers dried whole, and of this Mr. Morris says that "in order to dry these in this state they were obliged to select the smaller tubers only." These tubers average 2 inches in length, $1\frac{1}{2}$ inches in diameter, and $1\frac{1}{2}$ ounce in weight. The other sample consisted of slices only of larger tubers dried artificially. With regard to these he remarks that "these slices are from larger and riper tubers than the others, and probably they will be found to contain a larger percentage of resin."

The cultivation of jalap in Jamaica has within the last few years received some attention. The *Pharmaceutical Journal* [3], viii., p. 6, 1877, has the following notice of it in its editorial:—

"Cultivation of Jalap in Jamaica."

"According to the last Government report on the Jamaica Botanical Gardens, it seems that nearly two acres of land attached to the cinchona plantation is now systematically cropped with jalap, the crops during the past year amounting to 1,700 lbs., and it was estimated at the time the report was written, about the middle of February last, that at least 3,000 lbs. additional would be obtained in the course of a few months, which produce would be sent to England."

It was stated in the "Month" of September, 1880, that jalap had until lately been planted among the cinchonas, but was found to exhaust the soil, and, therefore, had been removed into new ground. The crops of jalap in the year 1879–1880, amounted to 14,924 lbs., and sold in the fresh state for £62 3s. 8d.

Mr. Morris says further in his letter accompanying the samples of jalap:—

"I am anxious to obtain some idea of the commercial value of the drug in the London market, and more especially the value of

the sliced tubers. I find it impossible to dry the tubers whole or gashed without artificial heat, and naturally this adds to the expense of the cultivation. Should the sliced tubers obtain a fair price, we could cure them without artificial heat and save nearly 2*d.* per lb. on the cost of production. We find that the jalap tubers lose over 70 per cent. in drying, so that it requires nearly 1,800 lbs. of green tubers to yield us 500 lbs. of marketable jalap."

It will be observed that Mr. Morris states in the former part of his letter that the slices have been dried by artificial heat, and further on that they can be cured without artificial heat.

I was requested by Mr. Holmes to examine the two samples of jalap, the small whole tubers and also the larger slices, with a view of ascertaining microscopically their internal condition, and also chemically the amount of resin in each.

The microscopical examination of the sliced tubers points to the probability that the slices were fairly dried before the application of any artificial heat, or the artificial heat must have been very cautiously applied. The surface cuts mealy, and the starch grains lie in the cells with but few exceptions in an unaltered state. The cell tissue is in its normal condition. The internal part is, however, horny. In the small tubers, on the other hand, dried whole, the starch grains are in an amorphous condition, the cells being filled with matter more or less granular. The texture internally is that of beeswax with concentric rings of laticiferous vessels. Each sample showed these vessels filled with resinous matter. The entire internal portion bore evidence of the application of heat whilst moist.

The chemical examination yielded the following results:

| | Tuber. | Sliced. |
|---------------------------------------|--|------------------------------|
| Dried at 220°-225° F., moisture . . . | 17.8 | 14.1 |
| Calculated | (Resin insoluble in ether (convolvulin of Mayer) Resin soluble in ether Total resin | 8.27 0.86 1.21 9.89 |
| on dry | | |
| substance | | |
| | | |

or calculated on the jalap in the state in which it was received, the tubers contained 7.55 per cent., the slices 8.17 per cent. of resin.

The resin had been freed from every trace of sugar.

As a result of these analyses it would appear that Jamaica-grown jalap yields considerably less resin than the average of good Mexican jalap (12-18 per cent.). The minimum amount of resin in a jalap intended for pharmaceutical purposes is generally admitted to be 10 per cent. The samples approach more nearly that grown

by Mr. Smith, Botanic Gardens, Trinity College, Dublin, which yielded 9·2–11·97 per cent. of resin. It is possible that by further cultivation Jamaica-grown jalap may in time compete with more favoured samples from other countries.

A vote of thanks having been passed to the author,

The PRESIDENT said this subject was of great importance, and not the less so because they knew how much interest the late Daniel Hanbury took in this question of the cultivation of drugs for which they had been formerly dependent on natural supplies. He was reminded by this paper that the report on the Botanic Gardens of Jamaica accidentally came into his hands some time ago, and he was the medium of its being sent to the Journal. He was glad to see some fruit from what seemed a trivial circumstance, and it was pleasing to know that in the various colonies the Botanical Gardens supported by the State were being used for eliciting information bearing on this question of the cultivation of drugs.

Professor TICHBORNE (President of the Irish Pharmaceutical Society) said Mr. Greenish had referred incidentally to a paper which was published by Dr. Walter Smith, and as he performed the estimations in connection with that paper, it might be interesting if he gave his experience of the English or rather Irish-grown jalap. It was not perhaps generally known that jalap can be grown successfully in this country, although it had not been grown commercially. The experiments were undertaken in the Botanical Gardens, Dublin, by Dr. Walter Smith, who succeeded in growing very large tubers; he had one now in his possession quite as large as a Swede turnip. But their experience was that the large tubers were inferior to the smaller ones in percentage of resin, the large ones only yielding about 9 per cent., whilst the smaller gave as much as 11. He took it from these figures that the jalap was really a better quality than that referred to that day. The Irish-grown jalap had never been introduced into commerce, but there was no reason why, in a city like York, where they had such wonderful facilities for growing these things, the experiment should not be tried on a commercial scale.

Mr. FLOWMAN asked if Mr. Greenish had any particular reason for selecting a temperature of between 220° and 225° for drying these roots, and if there were any special constituent in the jalap which retained moisture obstinately at 212°.

Mr. EXIN said he understood Mr. Greenish to say that the tubers

were unmistakably dried by artificial heat, and it would be interesting to know what characteristics decided him in that positive opinion.

Mr. CONROY having frequently had occasion to analyse specimens of jalap, said his experience entirely agreed with that of Professor Tichborne, that the large tubers of Mexican growth were much inferior to those of smaller size. Very frequently there was 25 per cent. less resin in the large tubers, and more starch proportionately.

Mr. J. R. YOUNG (Glasgow) said some years ago a partner in a very large house in Calcutta, knowing that jalap was very much in use amongst the natives, commissioned his firm to procure a considerable quantity, and they were instructed to pick out the largest-sized tubers they could get.

Mr. JOHN WILLIAMS said he should like to inquire of Professor Tichborne or any other gentleman who had worked on this question, whether he had examined the resin as to its characteristics, or whether he had merely taken resin as resin. The real question was, what proportion was soluble in ether, and what proportion not? In other words, whether the resin yielded by the jalap grown in Ireland was as active in its character as the resin from plants grown in Mexico? To put it in another way, had they determined the quantity of jalapin and convolvulin?

Professor TICHBORNE said no analyses of the Irish-grown root were made to determine the amount of resin soluble in ether.

Mr. SYMES said this appeared to be one of those instances in which a medicinal substance, when cultivated artificially, lost some of its activity, and developed such matters as starch, for there seemed to be a larger proportion of starch in this than in the ordinary root. Looking at the specimen, he should have thought it had been dried very slowly, and therefore he was surprised to hear it stated that it had evidently been dried by heat. If dried very rapidly, he should expect to find the sap diffused evenly through the whole root, whereas it seemed by some process to have collected slowly towards the centre of the slice where it was abundant, so that in each slice there was a large quantity of starch on each side enclosing resin, which would seem to show a slow collection of sap towards the centre, and condensation there.

Mr. SHENSTONE said he should have drawn rather the opposite inference from the appearance described. He had learnt, only the previous night, that soap makers, when they wished to keep the water in the centre of their soap and to have a hard outside crust, dried it as rapidly as possible. It seemed to him that this hard

outside crust was produced by rapid drying, which left the sap in the middle.

Mr. BRADY said he had really no knowledge on the particular subject before the meeting, but as the President had called upon him he might make a few observations on the cultivation of certain other drugs of interest to the pharmacist. Some details were then given respecting the growth of ipecacuanha and vanilla on a commercial scale in India, a subject which the speaker had last year brought before the Conference at its Swansea meeting.

Mr. GROVES said it seemed to be assumed that the centre portion of these slices was rendered dark by an excess of resin, but he would venture to suggest that it was not so, and that the appearance was produced by an alteration of the starch into dextrin. The same sort of thing often occurred in the case of aconite roots, which were rendered flinty by the same means. It appeared like resin, but it was not resin. He remarked also an absence of odour in these roots, which instead of having the fruity odour, characteristic of the Mexican roots, appeared to be entirely devoid of it. They seemed to be only adapted for making resin, and before doing that it would be necessary to carry out the experiment suggested by Mr. Williams.

Mr. GREENISH, in reply, said the statement that the larger tubers yielded less resin did not accord with the experiments made in connection with these tubers. It was evidently a very large tuber from which the slices were cut, as compared with the smaller specimens, and they yielded slightly more resin. With regard to the drying, Mr. Symes would find that in the paper he had anticipated his observations. The microscopical examination of the sliced tubers pointed to the probability that the slices were fairly dried before the application of any artificial heat. This view was suggested by the condition of the starch on the two surfaces and also the internal condition, as had been pointed out by Mr. Groves, where the starch would be found in a partially dissolved state. It was not resin in the centre, but it represented starch in an altered condition. In the slices most of the cells were full of starch to near the centre, and evidently little heat had been applied. As had been observed by Mr. Groves, this condition is found more particularly in examining the *Aconitum ferox*, which would always be found in this beeswaxy condition internally. At one time, in making sections of it, he thought it was due to resin, and found it so hard that it readily turned the edge of the knife, but on putting it into water it became evident that it was a substance in an intermediate condition

between starch and gum. He was asked why he had used the temperature he had named. It required a considerable temperature to dry this material effectually, and he did not think it could do any possible harm to the inside. Mr. Williams would see that the proportions of resin insoluble in ether or convolvulin, and that soluble in ether, were given separately. He might just remark that the late Mr. Hanbury took considerable interest in this question, and pointed out that several things had to be borne in mind with regard to the quantity of resin, as for instance the age of the tubers, and their being collected to the best advantage, and he also considered that a better method of drying should be adopted. It seemed that in 1862, Mr. Hanbury forwarded a jalap plant to Jamaica, where it grew luxuriantly, and it was then considered that it would become an article of commerce, and now in 1881, it was that this large quantity was being grown there.

The next paper read was on—

THE DETECTION OF SALICYLIC ACID IN URINE IN ORDINARY AND SPECIAL CASES.

By LOUIS SIEBOLD AND T. BRADBURY.

Salicylic acid is usually detected in urine by the direct application of the well-known reaction with ferric chloride. The first few drops of the reagent generally cause a precipitation of ferric phosphate; but on the addition of a moderate excess of the test solution, the purple-violet coloration due to the formation of ferric salicylate comes out distinctly. As this simple test is sufficiently delicate for showing the presence of salicylic acid in the urine of patients taking this acid, even in the smallest medicinal doses, it is not easy to understand why more troublesome modes of testing have been and continue to be recommended by chemists, except on the supposition that such tests are either more delicate or more trustworthy, or that they are applicable in special cases in which the usual direct test may fail. Robinet,* Pagliani,† and quite recently Bornträger,‡ have recommended the precipitation of the phosphoric acid, colouring matter, etc., from the urine by means of lead acetate, and the removal of the lead from the filtrate by sulphuric acid, previous to

* *Comptes Rendus*, lxxiv., 1321.

† *Gazz. Chim. Ital.*, 1879, p. 23.

‡ *Zeitschrift für Analyt. Chem.*, 1881, p. 87.

the testing with ferric chloride. We have examined this process and the various modifications of it that have been suggested, and find that the advantages arising from the absence of colouring matter and phosphates in the liquid to be tested are more than counterbalanced by the injurious effect of the free acid and by the dilution of the urine resulting from the addition of the lead solution and acid. Even if the removal of the lead by sulphuric acid be avoided, it would still be necessary to make an addition of this acid in order to destroy the red coloration produced by the reaction of the ferric chloride with the acetates introduced. We find the direct mode of testing to be preferable to the lead process, not only on account of its simplicity, but also because it surpasses the latter in delicacy. It is only in the case of very highly coloured urines, and in cases of urines containing so minute a trace of salicylic acid as to require concentration by evaporation, that the removal of colouring matter, phosphates, etc., affords any decided advantage. In such cases we recommend the following process, by which the introduction of acetates and of mineral or other free acids is entirely avoided:—

Mix the urine to be tested with a few drops of solution of potassium carbonate, or sufficient to render it slightly alkaline, then add strong solution of lead nitrate in excess, shake well, filter, return the filtrate to the filter until it passes through quite clear, and now test the clear liquid with a few drops of a very weak solution of ferric chloride.

In all ordinary cases, however, we prefer the direct addition of the ferric chloride to the urine. Should any one inexperienced with the test find the ferric phosphate, which is nearly always precipitated on adding the reagent, to cause any difficulty in observing the colour reaction, it is only necessary to add the iron solution drop by drop until a coloration begins to be perceptible, then to filter the mixture and to test the filtrate with a few more drops of the reagent.

One difficulty may present itself, to which we wish to draw special attention. It is known that diabetic urine occasionally contains a body forming a dark red coloration with ferric chloride. This body is by some chemists believed to be acetone, while others consider it to be the so-called aceto-acetic ether (ethyl-diacetic acid). We have had a good deal of experience with diabetic urine of this kind, and feel convinced that the body in question is not acetone; but it is not our intention in this paper to discuss the nature of this substance. Our only object in referring to it here is

to show how the disturbing influence of its colour reaction with ferric chloride on the test for salicylic acid may be overcome. If diabetic urine containing this substance is acidified with a few drops of hydrochloric acid, then shaken with an equal volume of pure ether, the ether decanted and allowed to evaporate in a dish without heat, and the dish, after the complete volatilization of the ether, left for some hours in an exsiccator over sulphuric acid and finally heated on a water-bath for about fifteen minutes, the residue, if any, when treated with a small quantity of water and a drop of weak ferric chloride solution, will not produce any coloration, provided that salicylic acid was absent. But in the presence of this acid the usual violet coloration will be instantly developed. In this manner, it is easy not merely to distinguish the iron reaction of salicylic acid from that of the said decomposition product of sugar, but also to detect that acid in the simultaneous presence of the latter.

In conclusion, we wish to mention an observation which may be of some interest to the medical profession. A short time ago one of us detected salicylic acid in the urine of a person who had not taken that acid or any preparation of it internally. The question arose whether its presence in the urine could be attributed to the outward use of a salicylic acid ointment which had been applied for some days previous. Experiments, made on ourselves, showed that salicylic acid, externally applied in the form of an ointment, is absorbed, and can be detected in the urine in less than twelve hours after the application. In one instance its occurrence in the urine was noticed for three days after the use of the ointment was discontinued.

A vote of thanks having been passed to the authors,

Professor TICHBORNE said it had been stated that carbolic acid was formed naturally in certain diseases, and that lately it had been demonstrated in some of the hospitals, or rather it had been demonstrated not that carbolic acid was formed, but that there was some substance in the urine which gave the same colour reaction, and was put down under the name of carbolic acid. If that were so, of course it would have similar reactions to salicylic acid and might account for a similar appearance in diabetic urine.

Professor ATTFIELD said the reason for regarding the ferric chloride reaction with a little disfavour had only been the difficulty with diabetic urine. As far as he knew, most chemists had always used ferric chloride as a test for salicylic acid, only taking care, of

course, to apply it to urine not diabetic. The alternative process which the authors had given would now render even that precaution unnecessary.

Mr. GERREARD said it had been mentioned that the ingestion of salicylic acid was demonstrated by its presence in urine. It had been recently shown by Mr. North, in *The Practitioner*, that the first change which took place when salicylic acid was taken was its conversion into salicyluric acid, and this change went on whilst there was any glycol present, but as soon as that disappeared, then salicylic acid only was present in the urine.

Mr. PLOWMAN said he should like to know whether any definite analysis had been made proving the presence of carbolic acid in diabetic urine. Several samples had been submitted to him where carbolic acid had been absorbed into the system from dressing wounds, and of course the urine then had a very dark colour, but it was wholly unlike diabetic urine. He had been asked to ascertain whether carbolic acid was present or not in samples, the colour of which was evidently due to the absorption of carbolic acid from the dressing of wounds, but hitherto he had been perfectly unable to detect a trace of carbolic acid in them. He hoped to be soon working further on the subject, and to ascertain how the carbolic acid was eliminated, but at present he was not able to find it as such.

Mr. SIEBOLD, in reply to Professor Tichborne, wished to state that in the course of a long experience in urine testing he had never met with a single instance in which ferric chloride, applied directly to urine, showed any indication of carbolic acid, and therefore the apprehension of any risk of confounding carbolic acid with salicylic acid might be at once dismissed. Carbolic acid, he believed, had been observed in urine, but never in such quantity that the direct application of the test with ferric chloride would indicate it. The only instance in which any difficulty would present itself was the one alluded to in some diabetic urines—by no means in all—where this so-called acetone produced a peculiar red coloration, not unlike that produced by the salicylic acid. How to proceed in that case had been shown in the paper. Putting that risk on one side, there was no instance known to him in which any other than the ordinary mode of testing need be employed, unless an abnormally high colour of the urine should make the preliminary treatment described desirable.

The next paper read was a—

NOTE ON THE ALLEGED PRESENCE OF NICOTINE IN INDIAN HEMP.

BY LOUIS SIEBOLD AND T. BRADBURY.

In a paper on Indian Hemp, published in the *Pharmaceutische Zeitschrift für Russland*, 1876, p. 705, Dr. Preobaschensky announced that he had isolated from this drug a volatile alkaloid identical with nicotine, and that he believed this base to be its active principle. The correctness of this statement was shortly afterwards called in question by Professor Dragendorff and Dr. Marquiss on account of the striking difference between the physiological action of Indian hemp and that of tobacco (see *Year-Book of Pharmacy*, 1878, p. 248). As a probable source of error, these chemists suggested that the *Cannabis Indica* used by Dr. Preobaschensky in his investigation might have accidentally contained an admixture of tobacco or of some other herb containing a volatile base. Nothing further was heard on this subject from either side, and the presence or absence of nicotine, or indeed of any alkaloid, in Indian hemp has thus remained a matter of uncertainty.

In order to settle the not unimportant question whether or not nicotine is a constituent of *Cannabis Indica*, we have recently worked up ten pounds of the drug in a special search for this alkaloid. The process we adopted for its extraction was first tested upon a mixture of Indian hemp and one-eighth of its weight of leaf tobacco, and subsequently on a similar mixture containing but half a drachm of tobacco to eight ounces of the hemp. In both cases the result was very satisfactory, nicotine being obtained in either instance in sufficient quantity to ensure its identification by its character and tests. The same process was then applied to the ten pounds of pure Indian hemp, the *modus operandi* being as follows:—The hemp was placed in a still with a suitable quantity of water rendered powerfully alkaline by caustic soda, and heated by steam until fully one-half of the water had passed over. The distillate was neutralized with oxalic acid and slowly evaporated to perfect dryness at a temperature not exceeding 70° C. The dry and pulverized residue was treated four times in succession with anhydrous ether, the ether in each case carefully poured off and rejected, the powder again dried, and then extracted with alcohol in order to separate any oxalate of nicotine from the ammonium

oxalate. The filtered alcoholic solution was evaporated at a very moderate heat, the residue dissolved in water, the filtered solution twice shaken with ether, and the ether decanted and rejected. The aqueous solution was then rendered strongly alkaline by caustic soda, again shaken with ether, the ethereal solution carefully decanted, and this treatment with ether repeated several times. The united ethereal solutions were filtered and allowed to evaporate on a large watch glass at an ordinary temperature. There remained a small quantity of a thick, oily, yellowish liquid which, after being left in an exsiccator over sulphuric acid for four hours, dried up to a transparent varnish. The substance thus obtained had a strong, peculiar, somewhat mice-like odour, which became more striking still on the application of heat, without, however, possessing the characteristic pungency of nicotine. The odour somewhat resembled that of conine, but was decidedly less powerful and less nauseous. This substance was soluble in alcohol and ether, but only slightly soluble in water, and still less soluble in solutions of caustic alkalies. It was powerfully alkaline to test-paper and capable of neutralizing acids. From its combinations with acids it was again precipitated by alkalies. Its solutions showed the following behaviour towards reagents:—

Platinum perchloride produced a pale yellow precipitate, which disappeared on boiling, but gradually reappeared on cooling.

Solution of iodine in iodide of potassium produced a kermes-coloured precipitate, which slowly disappeared again.

Mercuric chloride formed a white precipitate, soluble in excess of ammonium chloride.

Tannic acid produced a copious white precipitate.

Hydrochloric acid, nitric acid, and sulphuric acid, when dropped upon the substance, did not produce any characteristic colorations.

Chlorine water added to the aqueous solution produced a strong white turbidity.

The alkalinity of the substance, its power of neutralizing acids, its reprecipitation from the acid solutions by caustic alkalies, and its reactions with platinum perchloride, iodine solution, mercuric chloride, and tannic acid afford collectively the strongest possible proof of its being an alkaloid. It differs from both nicotine and conine in not being a liquid; from nicotine in particular by its markedly different odour, its very slight solubility in water, and the reaction of its aqueous solution with chlorine water; from conine by its reaction with platinum perchloride, and its odour.

A further chemical examination of this alkaloid was impossible,

as its entire quantity amounted to little more than two grains, and therefore no more than was required for ascertaining its behaviour towards solvents and reagents. Possibly our process may have involved the loss of a considerable portion of the base; but it should be borne in mind that our investigation was undertaken with the special object of proving the presence or absence of nicotine, and that while working in this direction we incidentally discovered the existence in Indian hemp of a volatile alkaloid different from the one we searched for. The asserted presence of nicotine in this drug may now be considered as definitely disposed of.

Pending further investigations, we propose for the volatile alkaloid of Indian hemp the provisional name "*cannabinine*." We intend to continue our research with a much larger quantity of material, so as to obtain a sufficient amount of the base in a pure condition, as well as of its platino-chloride, auro-chloride and other salts, for a fuller study of its characters and composition. The results we hope to communicate to the Conference at its next meeting.

Our best thanks are due to Messrs. Evans, Sons & Co., of Liverpool, and to Mr. M. Conroy, for their kind liberality in supplying the material for this research and conducting the necessary distillations.

The PRESIDENT, in proposing a vote of thanks (which was carried) to the authors, said a new alkaloid was not discovered every day, and he might congratulate the authors of this paper on that having been their result. He trusted further researches would be made on this subject, for which the Conference had funds at disposal, and he hoped the authors would if necessary apply for a grant.

Mr. MARTINDALE asked if there had been any opportunity of having this new alkaloid tried physiologically. The physiological action of nicotine was well known, and if the test were applied it would almost indicate at once whether it was nicotine; although he was quite satisfied that the chemical evidence brought forward was sufficient to show that it was not.

Mr. GROVES said no doubt the authors of the paper had entirely succeeded in their original intention of disproving the presence of nicotine in Indian hemp, but he was not sure that they had proved the existence in the herb of a volatile alkaloid of another kind. It

seemed to him very likely that the alkaloid had been produced in process of extraction by the action of a powerful alkali on some constituent of the hemp. He would suggest that when they repeated the experiment, instead of using caustic soda or potash they should try the action of lime or magnesia in isolating this volatile substance, when it was very possible they would not succeed in getting any at all. Of course the small quantity of $2\frac{1}{2}$ grains from 10 lbs. prohibited the assumption that this volatile substance could be the active principle; but possibly in the researches which were to follow, the authors would see if they could not extract the really active principle of Indian hemp and produce it.

Mr. GERRARD held the same views as Mr. Groves as to the use of caustic potash in detecting the presence of a volatile alkaloid. It brought about, no doubt, changes which might result in the production of an alkaloid. It was a very good plan in conducting researches to first demonstrate the presence of alkaloids in plants as follows:—After a resinous extract had been prepared, to treat that with water before it had been treated with any chemical reagent whatever, and to apply alkaloidal reagents, and thus establish to some degree the presence of an alkaloid. He should like to know whether Mr. Siebold did apply any reagent previous to his distillation to demonstrate the presence of an alkaloid.

Mr. A. C. ABRAHAM said that anybody who had made extract of Indian hemp would have observed that when the evaporation was conducted to a certain point, there was a liquid portion which separated from the solid portion, and for some time resisted the action of heat. When he first saw this statement regarding nicotine, it struck him immediately that this was very similar to nicotine, because nicotine did decompose in this way when subjected to heat. If it were not nicotine it might possibly be some alkaloid of a similar nature which decomposed in a similar manner. The odour was rather striking during that part of the process.

Mr. SIEBOLD said he believed the oily substance just referred to was nothing but the volatile oil of Indian hemp. They had met with that oil over and over again during their experiments, and been a good deal troubled with it. Its presence had made it necessary that the process should be somewhat longer than it otherwise would have been. With regard to the remark made by Mr. Martindale, they had not had sufficient material to go into the physiological question; it was one of those points which they had reserved for the future. With reference to the fact that they got so small a yield of the alkaloid, he wished to say they had reason to

believe that there existed in Indian hemp a much larger proportion of this alkaloid, but their process, though well adapted to the isolation of nicotine, was probably a wasteful one as applied to the isolation of this alkaloid. He spoke confidently on this subject because they noticed in the various evaporations of the oxalate of the alkaloid that a decomposition took place, and that each time it was repeated there was a loss of the alkaloid by decomposition. In reply to Mr. Groves' remark that the alkaloid they obtained might have been formed by the action of the caustic soda upon some other nitrogenous constituent of the drug, he would like to remind the meeting that distillation with caustic alkali was the first step in the process generally adopted for the extraction of nicotine from tobacco and of conine from hemlock, and the first step also in the recognised mode of isolating these and other poisonous volatile alkaloids in forensic analysis. As such it had been recommended and employed by great analytical authorities who would, in his opinion, have recognised the risk of an error due to the formation of artificial volatile alkaloids of similar chemical properties, if such a risk were likely. It was not impossible, however, that in the case of Indian hemp the alkali might have the action mentioned by Mr. Groves. At any rate they had no proof to offer to the contrary, and his suggestion would therefore receive their fullest consideration. They were obliged to him for making it.

The next paper was on—

COMMERCIAL SPECIMENS OF HYDROBROMIC ACID.

By J. C. THRESH AND R. WRIGHT.

Some little time ago we had occasion to prepare a little bromide of sodium, required in dispensing a prescription, and were surprised to find that upon adding hydrobromic acid to the requisite quantity of solution of bicarbonate of soda, a copious precipitate of cream of tartar was thrown down. This sample of acid had been obtained from a wholesale house, therefore we ourselves prepared a quantity by what is known as Fothergill's process. This acid reacted with alkalies in a similar manner. In making it, it was noticed that only a fraction of the theoretical amount of potassium acid tartrate was thrown down, and that when the acid was gradually added to the bromide solution a point ultimately was reached, beyond which the addition of more acid, or of more bromide and acid, failed to cause any further precipitation. This statement appears to hold

good also for the action of tartaric acid on the chloride, iodide, and cyanide of potassium.

To determine really the hydrobromic acid strength of acids prepared by this process, four samples were made with the proportions of acid and bromide theoretically required to produce solutions of five, ten, fifteen, and twenty per cent. respectively.

A little reflection will render it evident that the amount of alkali necessary to neutralize a given quantity of such a solution will be less than that required to neutralize the tartaric acid originally added, by an amount corresponding to the acid tartrate precipitated, and consequently to the hydrobromic acid liberated, unless we assume that acid tartrate of potassium is formed but not precipitated. That such is not the case will shortly be demonstrated. By this method we obtained the following results:—

| Theoretical percent. of Hydrobromic Acid. | | | | | Amount of Acid found. |
|--|-----|-----|-----|-----|--------------------------|
| 5 per cent. | ... | ... | ... | ... | 1·8 |
| 10 " | ... | ... | ... | ... | 3·8 |
| 15 " | ... | ... | ... | ... | 7·6 |
| 20 " | ... | ... | ... | ... | 8·7 |

A complete table of such equivalents, with certain corrections not here taken into account, would doubtless be interesting as a chapter in chemical statics, but would be of little interest pharmaceutically beyond showing that within certain limits the stronger the solution of bromide and acid, the greater relatively is the proportion of hydrobromic acid produced. In the examples given the numbers in the first column increase in arithmetical progression, whilst the three first numbers in the second column increase in geometrical progression. After the liquid comes to contain 15 per cent. of hydrobromic acid, little or no increase in strength is caused by adding more potassium bromide and tartaric acid.

Clearly, therefore, if it is desirable to make the acid by this process, the reacting substances should be dissolved in water in such proportions as to form theoretically a 15 per cent. solution, when an acid of from 7 to 8 per cent. will be produced. This strength is about the maximum obtainable by this method, and that in which the largest proportion of the materials used react upon each other.

Mr. A. N. Palmer, in a paper published in the *Pharmaceutical Journal*, March 1, 1879, gives an account of the examination of some acids made by Fothergill's and Wade's processes, and arrives at the conclusion that these acids contain the theoretical quantity of

hydric bromide, and are simply contaminated by the presence of the cream of tartar held in solution by the acid.

That such is not the case we consider proved by the fact that when the acid thus prepared is evaporated to a syrupy consistency, and placed aside to crystallize, the greater portion of the saline mass consists of potassium bromide, the excess of tartaric acid remaining in solution. Again, on Mr. Palmer's supposition, we cannot reasonably account for the fact that after the addition of a certain amount of acid and bromide no further precipitation of cream of tartar takes place.

When for potassium bromide we substitute potassium chloride, and attempt to make hydrochloric acid by action of tartaric acid on this salt, the proportion of bitartrate precipitated is still smaller, a result to be accounted for either by supposing aqueous hydrochloric acid to be a better solvent for this salt than hydrobromic acid, or more reasonably that the presence of a smaller quantity of this more powerful acid prevents the further action of tartaric acid on the chloride.

These considerations lead us to conclude that this medicinal agent is not what it is usually considered to be, containing only from a third to half the theoretical quantity of the active constituent, and as hydrobromic acids of various strengths, and made in different manners, occur in commerce, we collected a few specimens from different chemists of what would in each individual case have been dispensed for "acid. hydrobromic." Of eight samples examined, four were found to have been made by distillation, and to contain about 8 per cent. of hydric bromide; three had been prepared by Fothergill's process, and contained about 4 per cent. of acid instead of 8.2; the eighth sample had evidently been made as directed by Wade, and contained from 7-8 per cent. of acid instead of sixteen.

The variation in strength is not so great as had been anticipated, still it is evident a prescription for a mixture containing this acid may at one time be dispensed with acid double the strength of that with which it would be prepared at another. As a pure acid procured by distillation is both inexpensive and readily obtainable, and the acid made by action of tartaric acid on potassium bromide is undoubtedly a most unsatisfactory preparation, it should be discarded by pharmacists. It is easily recognised by adding to it drop by drop a little liquor potassæ and shaking. The fluid remains clear at first, then as more alkali is added abundance of cream of tartar suddenly precipitates. When only a little alkali is added, a precipitate will form if the tube is set aside for a time.

The variability in strength of this amongst numerous other remedial agents points to the necessity of some committee or society being empowered to issue from time to time (say annually) a mandate enjoining that when such remedies are prescribed without any reference as to strength or to maker, they shall be dispensed of a certain stated strength. Such an arrangement would save the dispenser much anxiety, and frequently prevent a good deal of annoyance both to dispenser and patient.

The PRESIDENT suggested that the discussion should be deferred until after the reading of another paper on—

HYDROBROMIC ACID.

By FREDERICK W. FLETCHER, F.C.S.

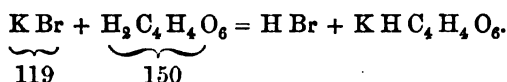
The pharmaceutical career of hydrobromic acid has not been a happy one. Although it is now fourteen years since its appearance in some wandering prescription began to perplex the British pharmacist, it remains to-day a cogent argument on the side of an International Pharmacoposia. And yet in our pharmaceutical literature it cannot be said to have a mushroom history. It is a venerable occupant of the columns of the *Pharmaceutical Journal*, in the first volume of which (June, 1842) appeared a paper by M. Millon, describing a method for its preparation from a mixture of bromine, bromide of potassium and phosphorus. The same reaction, in a modified form, is the basis of a process which has been recently advocated.

I have been unable to find any indication of its use in medical practice, prior to the publication of a paper by Dr. de Witt Wade, in the *Peninsular Journal of Medicine* of February, 1875. The remarkable efficacy which the bromides were found to possess in epilepsy, and other similar disorders, led Dr. Wade to infer that the acid bromide of hydrogen would be even more energetic in its action than the alkaline salts. Unfortunately, as Dr. Wade himself confesses, his first paper did not include a working formula for the preparation of the acid, but only a general statement that each fluid drachm of the acid represented 10 grains of bromine. This omission seems to have been the source of much of the confusion which has since prevailed, both as to the mode of preparation and strength of the acid. The idea of administering bromine in the form of hydrobromic acid soon found favour in this country, for

in April, 1876, Dr. J. Milner Fothergill published in the *British Medical Journal* a paper strongly advocating its use, supplementing his observations by a formula for its production from bromide of potassium and tartaric acid, the method previously suggested by Wade.

Dr. Fothergill's formula has been severely, and, I think, somewhat unfairly criticised. Exception has been taken to it, first, because the amount of tartaric acid is not sufficient to decompose the bromide of potassium, and secondly because the strength of the finished product is very much below that indicated in Dr. Wade's paper.

As regards the former of these objections, it may be remarked that Fothergill directs the use of 6,337 grains of tartaric acid for the decomposition of 5,188 grains of bromide of potassium, instead of 6,540 grains as required by the equation:—



The deficiency is only a little over 3 per cent., and when it is remembered that the purpose of the reaction is to secure all the bromine, and to get rid of as much tartrate as possible, I am inclined to think that the slight excess of bromide is not a disadvantage. The error, at all events, is on the right side.

As to the strength of the acid, it appears to me that in recommending its use, Dr. Fothergill was justified in adopting whatever strength seemed to him most suitable. In the current number of the *Chemist and Druggist*, Mr. Gilmour, of Edinburgh, in an able and interesting paper on "Hydrobromic Acid," suggests that it is possible that Dr. Fothergill "may have intended to prepare an acid half the strength of Dr. Wade's, and blundered in his calculations, or there may have been some confusion between the terms 'bromine strength' and 'bromide strength,' " etc. It appears to me that these and similar assumptions are somewhat unwarranted. Fourteen years ago it was not the custom to prescribe the bromides in such prodigious doses as are now fashionable. And inasmuch as the acid was believed, by those who were most experienced in its use, to possess an activity from four to eight times greater than the alkaline bromides, a strength corresponding to 8 grains of the potassium salt in the fluid drachm does not seem so very ridiculous.

Soon after the publication of Dr. Fothergill's paper, however, Dr. Wade, in a communication to the *Druggists' Circular* (a reprint

of which appeared in the *Pharmaceutical Journal* of November 17, 1877), complained that Dr. Fothergill's formula yielded an acid of much lower strength than had been originally recommended by him, and he then proceeded to give another process for its preparation from bromide of potassium and tartaric acid, which should yield a product containing 10 grains of bromine in the fluid drachm, or about 16 per cent. Hence there arose two preparations, both denominated "dilute hydrobromic acid," the strength of one of which was just double that of the other.

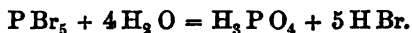
To complicate matters still further, Dr. Edward Squibb published in March, 1878, a new process for the preparation of the acid, resulting in a product of an altogether different strength. Dr. Squibb's method, which I shall presently have occasion to refer to, gave an acid containing 34 per cent. of H Br, against the 16 per cent. of Wade's and 8 per cent. of Fothergill's formulæ. The revisers of the U.S. Pharmacopœia have, as I think it will appear, very wisely adopted the strength indicated by Dr. Squibb. At present, however, the three rivals still remain in the field, leaving the pharmacist in hopeless bewilderment as to which one he is expected to favour when called upon to dispense "Hydrobromic acid."

Having thus sketched the position which hydrobromic acid occupies pharmaceutically, I will briefly refer to the various methods which have been suggested for its manufacture, giving details of the process which in my hands has proved by far the most satisfactory.

The first naturally to claim attention is that recommended by Wade and Fothergill, viz., the decomposition of bromide of potassium by tartaric acid. It is only fair to the authors to assume that this was never intended to be a manufacturing process, because, both from a chemical and an economic point of view, it is almost the worst that could have been devised. As a ready means by which the pharmacist could prepare the acid in small quantities, it had its advantages, more especially as at the time of its introduction, hydrobromic acid was but rarely met with as an article of commerce. The process is bad chemically, for the reason that it is based on the assumption that when atomic proportions of bromide of potassium and tartaric acid are brought together in aqueous solution, hydrobromic acid will be formed, and acid tartrate of potassium precipitated, the amount of the latter remaining in solution being assumed to be only such as would be contained in an equal volume of distilled water. As a matter of fact, quite a different

thing happens. Acid tartrate of potassium is itself decomposed by hydrobromic acid, with the formation of potassium bromide and tartaric acid. The credit of having first pointed out this fact belongs to Mr. A. N. Palmer, who, in a letter to the *Pharmaceutical Journal*, of April 17, 1877, states that an examination of the residue left on evaporation of Fothergill's acid proved it to consist, not, as was generally supposed, of acid tartrate of potassium, but of a mixture of bromide of potassium and tartaric acid.* My own experiments fully corroborate Mr. Palmer's observations,—the merest trace of carbonate being present in the residue after ignition. It is evident, therefore, that the amount of the two salts in a preparation made by Wade and Fothergill's process, will be directly proportionate to the strength of the acid, so that for practical purposes, the physician might almost as well prescribe a mechanical mixture of bromide of potassium and tartaric acid, leaving the stomach to effect the chemical decomposition. On the ground of economy, the process, as I need scarcely remark, stands condemned. The tartaric acid, itself an expensive salt, is wasted, and bromide of potassium is an unnecessarily extravagant source from which to obtain bromine.

The next process suggested was that of Professor Markoe, details of which will be found in the *Pharmaceutical Journal*, October 2, 1875. Phosphorus is placed in a jar and covered with ice, bromine is then cautiously added, drop by drop. Pentabromide of phosphorus (PBr_5) is formed, which in presence of water is immediately decomposed into hydrobromic and phosphoric acids, according to the equation,



This method is not only expensive but dangerous. A slight mishap in manipulation might be attended with unlooked-for results, and the operator might easily find some cheaper means of shattering his limbs and laboratory.

After this came Dr. Squibb's process, to which I have already referred. This consists in decomposing a hot supersaturated solution of bromide of potassium with sulphuric acid. The mixture is then set aside for at least twenty-four hours, to allow the potassium acid sulphate to crystallize out. The liquid portion is then drained away, the crystals washed twice with distilled water and the mixed solutions distilled. The distillate should have a sp. gr., according to Dr. Squibb, of 1.274, and contain 34 per cent. by weight of HBr . The method is a simple one, and is, in my opinion, the best of the

* See also *Pharmaceutical Journal*, March 1, 1879, p. 721.

many which have yet been advocated. It has been selected, as I have previously mentioned, by the revisers of the U.S. Pharmacopœia, and is recommended by Mr. Gilmour in his recent paper in the *Chemist and Druggist*. In my early experience in the manufacture of the acid, I used it with very satisfactory results. I was obliged, however, to abandon it on account of the length of time which it involved, and also of the cost of the product.

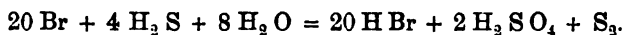
Another process advocated by Hager, and referred to in the columns of "The Month" (*Pharmaceutical Journal*, February 23, 1878), is that of causing bromine to act upon a solution of hyposulphite of sodium, the disengaged gas being conducted into water. As a method of preparing sulphurous acid, when expense is no object, it may be well to try it, but if hydrobromic acid is wanted, I should recommend the pharmacist to take *Punch's* advice, and—"don't."

One of the most interesting processes which have been yet devised is that of Champion and Pellet. The authors convey the vapour of bromine into melted paraffin, whereby a compound called brominated paraffin is formed. This, being subsequently heated to about 180° C., gives off nearly all the bromine which it has taken up, in the form of hydrobromic acid gas, which being absorbed by water leaves a product of great density. On a large scale and with special appliances, there is little doubt that the process would be a successful one, but it is obviously not adapted to pharmaceutical requirements.

A somewhat similar method has lately been introduced by G. Bruylants, based on the fact that the halogens are capable of combining at ordinary temperatures with certain organic substances, being again liberated from the latter, on heating, in the form of hydracids. The organic body selected by Bruylants for the formation of hydrobromic acid is the essential oil of copaiba, which is a hydrocarbon belonging to the terpene class. The details of the necessary operations may be found in the *Pharmaceutical Journal*, November 29, 1879, p. 423. Chemically, the process is very ingenious, but apart from the complicated nature of the mechanical details, this method of obtaining the acid seems to me rather suggestive of the famous Oriental, who created a conflagration for the sake of getting roast pork.

The last process which I shall refer to, is that which, as a manufacturer, I have been led to adopt as the best, and one which, after considerable experience, I can unhesitatingly recommend to pharmacists as yielding a perfectly pure acid, by simple means and at a

minimum of time and cost. The reaction upon which the method is based is familiar to every chemist, and I am confident that imaginary difficulties only have hindered its previous utilization. I refer to the decomposition effected by passing a stream of sulphuretted hydrogen through bromine in the presence of water. The following equation illustrates the reaction :—



The process may be best explained by giving the exact details for the preparation of about 14 pounds of 34 per cent. acid.

Into a flask of about 300 ounces capacity, place 120 fluid ounces of water and 5 pounds of bromine. Connect the flask with the wash bottle of a sulphuretted hydrogen generator, the delivery tube of which reaches to the bottom of the flask and dips into the bromine. Pass a brisk current of $\text{H}_2 \text{ S}$ through the apparatus for an hour or until the bromine has entirely disappeared. This may be known to have taken place when on agitating the liquid no red colour is imparted to it. The flask will now contain a mixture of hydrobromic and sulphuric acids, free sulphur, and a small quantity of a dark fluid, which is a compound of bromine and sulphur, but which decomposes, on boiling with water, into sulphur and hydrobromic acid.

The entire contents are at once transferred to a retort connected with a Liebig's condenser, and distilled.

The first portion of the distillate is weak in acid, and generally contains a little free sulphur carried over mechanically. The sp. gr. of the subsequent portions steadily increases until at last a sp. gr. of 1.500 is reached. This is fully saturated with fuming acid. The distillation may be continued until the residue in the retort is reduced to about 10 fluid ounces, or, if necessary, until a trace of sulphurous acid, which may be instantly recognised by its odour, begins to come over. The distillate is then diluted to a sp. gr. of 1.300, and should measure 172 fluid ounces and weigh 14 pounds, containing, as before stated, 34 per cent. H Br. According to Squibb, an acid of 1.274 sp. gr. is of this percentage, but, as Mr. Gilmour has already pointed out, this statement is an error. I have examined acid of this density, the sp. gr. of which was accurately determined by the balance, and the results which I have obtained both by titration and by estimating the bromine as a silver salt, show that the hydrobromic acid in such a solution is only 31.2 per cent. An acid of sp. gr. 1.300 contains exactly 34 per cent of H Br. This is undoubtedly the most convenient strength, and is that which

H H

might well be adopted by the compilers of the next Pharmacopœia as that of the stronger acid. I have placed on the table a simple arrangement (the materials of which every pharmacist will have at hand), to illustrate the production of half a pound of acid of 34 per cent. strength, equivalent to rather more than two pounds of Fothergill's preparation, at less than one-third the cost as compared with his process. The acid thus obtained should give no precipitate with barium chloride, and when pure zinc is placed in it, the disengaged gas will not blacken paper moistened with solution of acetate of lead. It leaves on evaporation no residue, or merely a trace.

I can testify, from my own experience of the process, that it is equally well adapted for the manufacture of a pound or a hundred-weight of acid, the whole operation in the former case being completed within an hour.

The thanks of the Conference having been voted to the respective authors of these papers,

The PRESIDENT said the process for the production of a remedy like hydrobromic acid being proved to be so wasteful in two directions, it was certainly time that an alteration was made. It was no doubt very convenient to every chemist when Drs. Fothergill and Wade proposed the use of this remedy that it could be made at a trifling cost with great readiness, but the extensive use of the remedy had now placed it quite beyond that stage of convenience, and Mr. Fletcher appeared to have thoroughly established his case for a totally new mode of production.

Mr. WELLCOME, in speaking of Professor Markoe's process, said that it had proved itself a very dangerous one in some hands. Many would no doubt remember the accident which occurred to Dr. Pile, of Philadelphia, through using it. Professor Markoe seemed to have met with success, but he undoubtedly conducted the process with a great deal of care. In America there had been a great deal of confusion and some errors made in consequence of the variations in strength and the variations in the products produced by the different processes, and therefore he was sure Mr. Fletcher's process would be much appreciated by dispensing pharmacists.

Mr. CONNOR thought Mr. Fletcher's process seemed a very feasible and beautiful one. He should like to ask him at what temperature he thought it necessary to distil the acid. He did not mention whether steam heat or fire heat was used, but he presumed it would be fire heat. One thing should not be overlooked in the production

of pure acid, namely, that were a pure acid used of the strength that Fothergill's was supposed to be, the pharmacist who dispensed it would probably get into trouble with the medical man. In the sale of a pure article care should be taken to state that it was different to what pharmacists had been in the habit of using.

Mr. MARTINDALE said with regard to acid intended to be used in medicine, that prescribed by Fothergill's process was the one mostly required, and it was only proper, out of due respect to him, to follow his process. Physicians who prescribed the acid no doubt meant to do so with reference to his paper. The preparation was impure, but he had found in making it that it might be considerably purified. Having noticed that a good deal of crystalline deposit took place if the preparations were made in hot weather, he always cooled it down by a freezing mixture, to separate the crystalline matters.

Mr. NAYLOR asked if there was any advantage in this process beyond that of economy over the decomposition of barium bromide by sulphuric acid and distillation.

Mr. PLOWMAN said his experience with regard to hydrobromic acid was wholly different to that of Mr. Martindale. He did not find that physicians expected Fothergill's acid to be used, and in nine cases out of ten they did not know that Fothergill had devised a process, and when they were asked what hydrobromic acid they would like dispensed, they said, "Oh, the usual thing." That was a strong argument in favour of introducing a pure definite article into the Pharmacopœia.

Mr. J. WILLIAMS thought there was an objection to the process now brought forward, and that was in the distillation. His opinion was that if a process for it was to be recognised in the Pharmacopœia, the hydrobromic acid should be formed in the state of gas, and condensed in water as hydrochloric acid was produced, the specific gravity giving the strength required for medicinal or other purposes. He had made very large quantities of hydrobromic acid at times, and found himself that the after distillation was a very troublesome and somewhat disagreeable matter, especially as in the present case there was a mixture of sulphuric and hydrobromic acids, whereas condensing the gas into pure distilled water always yielded a perfectly pure and definite acid, the gas being passed in until the density required was obtained. The most beautiful way of making hydrobromic acid was certainly the slow addition of bromine to camphor; and when there was a large demand some years ago for monobromide of camphor, and it had to be made in

considerable quantities, manufacturers always condensed the resulting hydrobromic acid gas in water. The sale for the bromide of camphor was sufficient to cover the cost, but under ordinary circumstances camphor was far too expensive a material for the purpose. It was only a pity that the demand for the brominated body was not sufficient to permit them to use camphor as the material for making hydrobromic acid gas. He was quite sure that any process which would work satisfactorily must be one in which the pure hydrobromic gas should be condensed in distilled water, and not one which required distillation of the mixture afterwards.

The PRESIDENT said it would be quite possible to give a good many illustrations of other cases in which they would like to fit the demand to the supply. He observed that there were several pure chemists present that morning, and he should like to have an opinion from them as between Mr. Fletcher's process and the suggestion of Mr. Williams.

Professor ARMSTRONG said there were one or two methods which might be easily used for making this acid, but there was no question amongst chemists that the one method to be preferred to all others was that of acting on phosphorus with bromine in presence of water in such a manner as to produce the gas and pass that into water. There was no difficulty and no danger whatever in that process, if proper quantities of phosphorus and water were present, and the bromine were added in a proper manner. With regard to the suggestion Mr. Williams made, of using camphor, there was a very similar process mentioned by one gentleman, that of acting on some of the terpenes with bromine and then passing the gas into water. There was a considerable difference in the behaviour of different terpenes in this respect; all would furnish a considerable amount of hydrobromic acid when bromine was added to them and the temperature allowed to rise, but the employment of a great many of them would be very uneconomical. Orange oil, if used, would probably be as good a material as camphor.

Mr. WILLIAMS said half the bromine was lost by that method.

Professor ARMSTRONG said with orange oil there would be no such loss, as nearly the whole of the bromine could be obtained in the form of hydrobromic acid.

Mr. FLETCHER, in reply, said with regard to the temperature at which the distillation took place in manufacturing, a direct fire heat was employed. Hydrobromic acid was by no means so volatile as was frequently supposed; the weak acid might be concentrated in an open vessel until it contained 30 per cent. without any appre-

ciable loss. As to the comparative expense of acid made by this process, and that made by Squibb's or the bromide of barium process, he need only say that it was quite evident that there could be no cheaper source of the acid than bromine; if it were obtained from a salt, the salt must first be made, and the bromides must be more expensive than the element itself. Bromide of potassium contained about 67 per cent. of bromine, and was very nearly the same price. Mr. Williams had objected to the process because it was not one in which the acid was obtained by passing the gas into water. He was quite aware that the latter would be undoubtedly, on a large scale, the best process, but his object was not to describe a manufacturing process specially, but a process which every pharmacist could use for himself with very little difficulty. As a matter of fact it was just as well adapted for making a pound as a hundred-weight. It was the only method yet pointed out by which pure hydrobromic acid could be obtained cheaply, and he thought even in that respect it had some advantage. Mr. Williams had confessed in using camphor half the bromine was lost, but he thought pharmacists were not prepared to lose half their bromine or throw away their camphor.

The next paper read was a—

NOTE ON GLYCERINUM ACIDI GALLICI.

By T. E. THORPE, F.R.S.

This preparation is made, according to the British Pharmacopœia, by rubbing together 1 part of gallic acid with 4 parts of glycerol, and heating the mixture until complete solution is effected. It is advisable to call attention to the fact that unless great care is taken to prevent overheating, the gallic acid may be converted into pyrogallol. I have shown (*Chemical News*, 43, 109; *Journal of the Chemical Society, Abstract*, 1881, p. 662), that at a temperature of from 190° to 200° C. this conversion in presence of glycerol takes place very rapidly, the gallic acid being transformed into the theoretical quantity of pyrogallol, and I have recommended this process as a ready method of preparing pyrogallol for alkaline development in photography. As *glycerinum acidi gallici* is intended for internal use, the possible presence of pyrogallol may be attended by unlooked-for consequences, this body being highly poisonous. According to Personne (*Comptes Rendus*, 69, 749), it

acts in the same manner as phosphorus, namely, by abstracting the oxygen of the blood. Two or three fatal cases have been recently reported in the photographic journals from pyrogallol having found its way into wounds or cuts during the processes of dry plate manipulation.

The PRESIDENT, in proposing a vote of thanks to Professor Thorpe, said the matter had a distinct interest for pharmacists, if regarded as one in which it was possible that variations in the process might cause such important deviations from the standard required. The introduction of even small quantities of pyrogallol into such a remedy as *glycerinum acidi gallici* was a very important matter. This happened incidentally to be an illustration of how the progress of one science might affect other sciences and arts. The introduction of dry plates in photography caused a wonderful development of the art in regard to its use by amateurs, and since the abolition of the horrors and inconvenience of the wet process it had proved such an attraction to scientific men, to ladies and tourists, and to all who wished to preserve records of what they had seen, that it had come into quite general use. Thus Professor Thorpe had taken the matter up, and as soon as this art, which had been left in the hands of photographers, became studied by pure chemists, it received important improvements, such as Professor Thorpe had referred to.

Mr. SCHACHT said there was no question about the importance of this matter, not only to medical men, but to pharmacists and chemists. He would ask whether this change took place only when the temperature had reached a certain exact elevation, or whether it was possible that a long continuance of a somewhat lower temperature would produce the same effect. The Pharmacopœia directions allowed the employment of heat, the words used being one of this vague character, "gentle heat or sufficient heat," and it was possible that, accidentally, without any want of care, a prolonged heat, although not of great temperature, might be employed, and it was a point of some consequence to know if this change were possible under such circumstances.

Mr. MARTINDALE said that such was not the case was shown a year or two back by Mr. Gale. He showed that if gallic acid were dissolved in glycerine at a low temperature, as the Pharmacopœia directed, and if diluted in an equal quantity of water, it all went into a mass of gallic acid crystals. Now if pyrogallol acid were present it would be held in solution.

Professor ATTFIELD said the question was not whether the whole

of it would be converted into pyrogallic acid, but whether any might be, and it would be interesting to know if any pharmacist had reason for believing that this transformation had ever occurred, even to a slight extent. It was not likely to have occurred, because the Pharmacopœia, in directing a gentle heat to be used, would not lead pharmacists to use anything like the temperature mentioned.

Mr. BENDER believed the *glycerinum acidi gallici* was not largely used in medicine, but it so happened that in the *British Medical Journal* of the previous week, a correspondent, a medical man, writing about the utility of some solution of gallic acid, drew attention to the fact that this acid is readily soluble in solution of neutral potassium citrate, 15 grains mixed with 20 grains of the citrate and 1 ounce of water forming a perfectly clear solution. He (Mr. Bender) had repeated the experiment, and had also observed that gallic acid is very soluble in solution of borax and in liq. ammon. cit., B.P. What condition the gallic acid was in in the mixture he could not say, but it dissolved with great rapidity.

Mr. CONROY said an instance had come under his notice two or three weeks previously, but it was the only instance he had ever seen, where half a gallon of the *glycerinum acidi gallici* was being made, and by some carelessness on the part of the person making it, he allowed the heat to be either too prolonged or too high, and the consequence was there was a deposit in the vessel on the following morning of fully half an inch of pyrogallic acid.

Mr. PLOWMAN said the subject reminded one of certain statements in connection with glycerine and astringent matters generally. Lately he had had to dispense glycerine of gallic acid a good deal, and a complaint had been made that it had not the same effect as when the ordinary crystalline gallic acid was used in a mixture. That reminded one of the statements which had been made that glycerine in combination with astringents modified very much the action of those astringents. He had not seen any reference to the cause of this, but the note and the discussion suggested that investigations might be made to clear up this point.

Professor TICHBORNE said most of the chemists present would see that the deposit referred to by Mr. Conroy could hardly be pyrogallic acid. He had an experiment tried some time ago in which gallic acid was left in contact with pure glycerine at about a temperature of 100° F. for three days in a steam-closet, and in that case he found a certain amount of decomposition had taken place, and some pyrogallic acid was formed, thus proving that time was equivalent to greater heat.

Professor THORPE said the only point he had to reply to was the question of temperature. On this he had not any very exact information to offer, as at the time he made the experiments his attention was not especially directed to it. As far as he was able to say, he thought this action certainly did not begin, at any rate to any appreciable extent, much below the boiling point of water. He should think it was perfectly safe for this solution of gallic acid to be made in glycerine at about 100° C. With respect to the formation of solid matter going on concurrently with the formation of pyrogallie acid, that had never come under his observation, and was very problematical considering the easy solubility of pyrogallie acid.

The next paper read was a—

NOTE ON HEAVY PARAFFIN OIL.

By CHARLES SYMES, PH.D.

Crude petroleum and rock oils contain a number of bodies of scientific interest, but when distilled commercially they yield benzoline or petroleum spirit, burning oils of various densities, heavy or lubricating oil, a soft, uncrystallizable, fatty substance, which, when highly purified, is known as vaseline, petroleum jelly, cosmoline, unguentum petrolei, etc., and paraffin wax of various degrees of hardness, and melting at various temperatures, from 100 – 128° F.

These products are saturated hydrocarbons, characterized by their chemical indifference to other substances. The body to which I wish specially and briefly to direct attention is the heavy oil, which, although used extensively for lubricating purposes, has not, as far as I am aware, found its way into pharmacy, except in combination with paraffin wax, as a solid, more or less crystalline substance. The best oil, as usually found in the market, is of the colour and specific gravity of olive oil ($\cdot 910$), possesses a boiling point above 480° F., and but little odour. It is optically active, rotating the polarized ray $-3\cdot 50^{\circ}$. It sometimes has a slightly acid reaction, probably due to the treatment it has previously undergone in its purification. These latter objectionable qualities can be removed by passing it through ordinary granulated animal charcoal, and it is then in a suitable condition for such pharmaceutical purposes as it is adapted for. It has, even when thus further purified, some amount of fluorescence (commonly known as bloom), which has

been regarded as objectionable; the oil imported from Russia has very little of this, and in the sample I have here (somewhat paler and thinner than the other) it is entirely absent. It is by no means certain, however, that a ready method of destroying this characteristic is desirable, inasmuch as it would render it capable of being used for purposes of adulteration, from which, happily, it is now precluded on account of its easy detection.

Heavy paraffin oil is in itself an excellent emollient when applied to the skin; but, in addition to this, I feel satisfied it might be used with advantage as a vehicle for many more active remedies. It dissolves half its weight of camphor, thus forming a strong camphorated oil, which keeps good indefinitely. Mixed with one-twentieth of its weight of carbonic acid, we have an excellent antiseptic dressing for wounds; it also dissolves thymol and menthol when gently warmed. Simple ointment, in which the almond oil is replaced by this oil, is an excellent basis for other ointments, as it does not readily become rancid, the paraffin oil not only resisting oxidation itself, but acting as a preservative of the lard present. In this latter remark I have been anticipated to some extent by Mr. J. B. Moore, of Philadelphia, who published an elaborate paper in the July number of the *New York Druggists' Circular*, "On a New Basis for Ointments and Substitute for Lard." His proportions were somewhat different from mine, and he used cosmoline, not paraffin oil; but the general results were the same, and his experiments were conducted through a long period, and under trying circumstances as to temperature.

The ointment, of which I have here a sample, is of a pale yellow colour, is about the same consistence as ordinary simple ointment, free from odour, and keeps good for a long period.

These are only a few of the useful purposes to which, in my opinion heavy paraffin oil might be applied in pharmacy.

A vote of thanks having been passed to the author,

Professor ARMSTRONG said one very remarkable statement was made, namely, that this paraffin oil was dextrorotary. He should like to know the length of the tube used.

Mr. SYMES said it was a 100 mm. tube.

Professor THORPE said this was the first example of any product got by destructive distillation having such optical properties.

Mr. BENDER asked if there was not a little practical difficulty in the use of mineral fats as substitutes for animal fats, namely, the

difficulty with which they were removed from linen or the skin by means of soap.

Mr. ALLEN said it was entirely new to him that the petroleum products had any rotary action or polarized light; at the same time he would remind Professor Thorpe that rosin oil, which was a product of destructive distillation, was not unfrequently optically active.

Dr. TILDEN said it occurred to him that a trace of turpentine might have got into the particular specimen which Mr. Symes examined, which might produce the effect referred to.

Mr. ALLEN said with respect to fluorescence he might say that one of the processes by which these oils, or at any rate shale oils, which were very similar, might be deprived of fluorescence was by treating them with nitric acid, or certain other oxidizing agents in a very limited manner. It was possible in many cases where they had been artificially "debloomed," so to speak, to restore them so as to indicate the origin of the oil, by mixing it with sulphuric acid, in which case the bloom or fluorescence reappeared. However, there came from America a heavy lubricating oil, naturally free from bloom, and in which no bloom could be developed by treatment with acid. Respecting their mixture with other oils, it was an interesting fact that these petroleum products did not mix with castor oil. Castor oil dissolved about an equal measure, but any further quantity did not mix with the petroleum oil; it was an extraordinary thing that castor oil should constitute an exception to the other fatty oils which they were in the habit of thinking were so easily miscible with these hydrocarbons.

Mr. GERRARD said on the pharmaceutical side of the question, he had made a considerable number of experiments in a similar direction to those of Mr. Symes. The ordinary commercial lubricating oils were not at all adapted for medicinal use and application. They were subject to considerable variation, as might be easily demonstrated by the application of a little strong sulphuric acid to any of the commercial lubricating oils; most of them became blackened to a high degree. He had devised a process for the purification of these oils, which had been used to some extent at the University College Hospital, and also largely during the epidemic of small pox at a hospital in North London. The method adopted was to treat the ordinary lubricating oil first with strong sulphuric acid, which produced a considerable charring, and then to allow it to stand for some time, when a clear oil separated, which was removed, and it was well washed with caustic soda or ammonia; then the clear oil

was removed again, and well washed with water until it gave a neutral reaction. This purified oil, when treated with about one-sixth of its weight of paraffin wax, formed an ointment basis exactly similar in composition and physical properties to the substances now being sold to imitate vaseline. They all possessed a crystalline structure which must be considered to be a disadvantage when compared with vaseline.

Mr. A. C. ABRAHAM said that these lubricating petroleum oils were very often adulterated, with the intention of improving them, with fatty oils, and that might possibly account for the results obtained, to some extent.

Mr. FLETCHER asked if Mr. Symes had found that the agitation with acid, of petroleum having a bloom or fluorescence destroyed that fluorescence, as Mr. Allen had stated; and if so, what acid produced that effect. It was a fact, well known to every pharmacist, that the fluorescence of quinine was entirely destroyed by a mere trace of hydrochloric acid, and it would be interesting to know whether the same thing occurred with paraffin.

Mr. CONROY said his experience was that with the better qualities of heavy mineral oil, about one-third was dissolved by castor oil, but very singular to say, the portion dissolved by the castor oil contained the principal portion of the colouring matter of the mineral oil. He had worked in that direction for a short time with the hope that he would be able to decolorize mineral oil with castor oil; but he had not been successful. Although he was able to remove the greater portion of the colouring matter, still there was too much of the mineral oil dissolved away with it. In reference to what Mr. Gerrard had said relative to the articles in the market of the nature of vaseline, he must emphatically, in connection with one of them, contradict the statement that it was made with paraffin wax.

Mr. STYES, in reply to Dr. Tilden, said he took a good commercial specimen, and, therefore, he probably had not sufficiently assured himself of the absence of possible impurities. But when one spoke of destructive distillation, he should rather regard the process of obtaining these things as one of fractional distillation; he was not sure the temperature used was sufficient to be regarded as destructive distillation, but merely as a separation of the constituents already existing in the crude substances. With regard to the difficulty of removing it from linen, he had only to call attention to the fact that there was such a thing as vaseline soap, and if there was any vaseline in it, he supposed it possessed cleansing detergent properties.

The treatment Mr. Gerrard referred to, alternately with acids and alkalies, was the one he referred to as possibly helping to cause the acid reaction; but the oil was always subjected to that process in purification to get rid of olefines and some other impurities. He feared if any one attempted to make artificial vaseline with paraffin wax of low melting point to the proportion of 1 to 7, it would be nearly all oil in summer weather. It required from 20 to 25 per cent. of low melting point paraffin. From some experiments made in that direction, he found the higher the melting point of the paraffin used, the more crystalline would be the product, and the less percentage of paraffin would be required; whilst the lower the melting point of the paraffin, the more would be required and the less crystalline and better the product, and the nearer it was to the substance known as vaseline. But he took it all these substances, vaseline and such like, had never been in the crystalline condition. They were the soft fatty substances of which he spoke, which in an impure state were used for lubricating. It was this fact which gave it the particular jelly-like look so different to most of the artificially produced bodies.

The Conference then adjourned for luncheon.

On resuming, a paper was read entitled—

RESULTS OF EXPERIMENTS MADE UPON THE BARKS OF CINNAMON AND CASSIA, ALSO UPON THE OILS EXTRACTED THEREFROM.

By J. WOODLAND, F.L.S., F.C.S., ETC.

Wishing to ascertain if possible the substance which causes an iodized decoction either of cinnamon or cassia to lose its blue colour, I made experiments upon the known constituents of the drugs with the result of finding that the volatile oils possess the property of absorbing iodine to a considerable extent, which peculiarity the other known constituents of the drugs seem to lack, and as far as the experiments made at present determine, the oils are the only constituents having that decolorizing power.

The oils of cinnamon and cassia both take away the blue colour imparted by iodine to a decoction of starch, and that of the former drug possesses this property to a much greater extent than is the case with that of cassia, although not in any constant proportion, the amount of iodine that is absorbed by the oils being dependent

upon the age of the sample in an inverse ratio, as the greater the age of the oil the smaller is the quantity of iodine solution absorbed by it. This decolorization is more especially seen when the oil and iodine are dissolved in the same medium, such as rectified spirit or carbon bisulphide; but if the oil be diffused in water, and iodine solution with starch paste added, although the decolorization takes place quickly at first, yet after a time it proceeds but slowly, owing to the imperfect contact of the reacting agents. Iodine also dissolves in both of the oils, more quickly in that of cinnamon, and if the iodine be in excess, it imparts to the solution in oil of cinnamon a rich reddish brown colour, whilst the more slowly formed solution in oil of cassia has a dull greenish brown colour, with a very slight appearance of red after shaking.

The quality of cinnamon or cassia bark being dependent upon the amount of oil contained therein, it occurred to me that samples of these barks might have their value approximately determined by treating infusions or decoctions of them with a standard solution of iodine, and accordingly experiments were made which show that although the quality of a bark of cinnamon or cassia can be quickly ascertained, the total amount of oil will not be indicated on account of the time taken by the oil to absorb the iodine. Decoctions of commercial samples of the powdered drugs were made, 1 gram of each being taken, and four of them absorbed a decinormal solution of iodine in the following quantities:—

| Cinnamon. | Cassia. |
|--|---------------------|
| No. 1 took 6·9 c.c. to impart a coloration. | No. 1 took 3·7 c.c. |
| No. 2 took 4·5 c.c. to impart a coloration. | No. 2 took 2·1 c.c. |
| No. 3 took 4·9 c.c. to impart a coloration. | No. 3 took 3·3 c.c. |
| No. 4 took 11·8 c.c. to impart a coloration. | No. 4 took 2·3 c.c. |

The iodine solution was added until, after shaking well, a distinct colour was seen in the froth. Of the four samples of cinnamon, numbers 2 and 3 were poor ones, as there was not much odour emitted by them, and from these and other experiments made, a sample of an average quality ought, if 1 gram be boiled with water and then cooled, to take at least 6 c.c. of a decinormal solution of iodine to colour the froth. Cassia bark requires a much smaller amount of iodine to colour the froth, first, on account of the oil not absorbing so much as before mentioned, and, secondly, on account of the bark containing a smaller percentage of oil.

In ascertaining if there is any other ingredient or principle in the cinnamon bark which absorbs iodine, great difficulty was experienced in expelling the whole of the volatile oil, for after boiling the

powder with a strong solution of salt for four hours, the odour of the oil was still perceptible, and the decolorizing properties still evident. Hence I conclude that a considerable quantity of this ingredient must be left behind after the distillation of the bark with salt water, as I am informed is the process in Ceylon, and I should like to have the experience of any one who has witnessed the operation, there or elsewhere, related.

After trying various chemicals, I found that litharge liberates the oil to the largest extent, and also the most quickly, but as with the others, incompletely, although whether its action is chemical or physical I am not prepared to say. The oil was finally got rid of by boiling the powdered bark for a considerable period with a strong brine, afterwards with a small percentage of slaked lime to convert the residue of the oil into cinnamate of calcium, and on acidifying one portion slightly with acetic acid, and adding iodized starch, the colour was not removed, and no odour was perceptible on heating; through the other portion carbonic anhydride was passed, to convert any slaked lime into the carbonate, which was then boiled, and to the cool decoction iodized starch added with a negative result. These experiments lead me to suppose that the oil is the ingredient that alone possesses the decolorizing property; but what compounds are formed beyond that of hydriodic acid when the oil and iodine combine, I am not at present able to state.

The same difficulty was experienced in attempting to exhaust the drug of its oil with benzol, carbon bisulphide, chloroform, ether, rectified spirit, and alcohol, although they were used both hot and cold, as the residue when slightly heated invariably gave off the odour of the oil, and a decoction bleached iodized starch paste.

It having recently come to my knowledge that oil of cassia is substituted for oil of cinnamon, a few experiments were performed, by some of which a distinction can be made between the two oils. If nitric acid, sp. gr. 1.36, be added to oil of cinnamon (1 part of the latter to 2 of the former), and the mixture shaken, a bright orange-coloured liquid is first obtained, upon the surface of which floats an orange resinous substance which slowly becomes deeper in colour until a beautiful cherry-red colour is visible, by which time it has changed to a liquid that floats on a lighter coloured substratum, which also in a short time becomes nearly of the same tint; bubbles then commence to appear, and shortly afterwards spontaneous ebullition occurs, with the evolution of nitrous fumes and vapours of benzoic aldehyde; by the time this ebullition has ceased, the amber coloured liquid commences to clear itself, and

finally a *clear* amber liquid is left, with orange globules floating on the surface.

Upon oil of cassia nitric acid, sp. gr. 1.36, has quite a different action, as after mixing 1 part of oil of cassia with 2 of nitric acid, a dirty green supernatant resinous mass (slowly turning brown) is seen floating on a yellowish liquid, and no further change is undergone; if a large excess of the acid be added after the first addition, the resinous mass changes to a deep reddish brown, and the subnatant liquid takes a cherry-red colour. The same reaction occurs if a large excess of nitric acid be added to oil of cassia at first, but in neither of these cases is there any spontaneous ebullition or evolution of the nitrous fumes and benzoic aldehyde vapours.

If oil of cassia be mixed with oil of cinnamon, the reaction with nitric acid takes place as with oil of cinnamon, but more tardily, according to the amount of cassia oil present; and at the end of the process a *turbid* subnatant liquid is seen instead of a clear one, as is the case with pure oil of cinnamon.

Spirit of nitrous ether can also be used to distinguish between these oils, as it forms a clear solution with that of cinnamon, but a turbid one with that of cassia.

Distinction can also be made between the powders of cinnamon and cassia, for on shaking cinnamon powder with iodine water, a greenish brown colour only is seen, whilst cassia powder treated similarly imparts a black colour. A better way, however, is to make a decoction of the powder and, when cold, add tincture of iodine in excess, when on shaking well in a test-tube the froth of the cinnamon decoction is distinctly yellow, and that of cassia grey or black, and if cassia powder be mixed with cinnamon the characteristic froth of the cassia can be distinctly seen.

A vote of thanks was passed to the author of this paper.

Professor ATTFIELD hoped that the author would continue his experiments with the view of ascertaining the special conditions under which this substance would absorb iodine. The absorption of iodine by essential oils was a matter involved in a good deal of obscurity. The amount absorbed appeared to depend a good deal on conditions, and if Mr. Woodland would look into those conditions, it was possible he might be able to give a good method of distinguishing between these substances.

Mr. BRADY said with regard to the employment of salt water in the distillation of oil of cinnamon, he had seen a statement to that effect, in Pereira's "*Materia Medica*," and it had been repeated

elsewhere, but he did not think that salt was employed generally in Ceylon. In the only distilling establishment he visited, not only was salt water not used, but the distilled water was used again and again, for a manifest economic reason.

Mr. GREENISH said he had heard Mr. Brady state that there were several kinds of cinnamon,—eight or ten; he should like to know whether the particular kind of cinnamon used in these experiments was noticed, because naturally it would have an influence on the result.

Mr. BRADY said the different kinds were merely planters' varieties; he did not think any one could define them. A planter would be able to tell the different sorts, but he did not think there were even commercial names for them.

Mr. GREENISH asked if there were any mode of distinguishing them.

Mr. BRADY replied certainly not, except by an expert. It was more like commercial sorting than botanical separation.

Mr. GREENISH said probably it would have an influence on the result of the experiment.

Mr. BRADY said practically oil of cinnamon was made by the poorer planters, usually half-caste Portuguese, who would not take the trouble either to cultivate the shrub properly or to prepare the bark for sale as fine cinnamon, and it was quite a question whether growing the finest cinnamon really paid the planters so well as using it in the rough condition as chips for distilling the oil.

The two following papers were then read—

AN IMPROVED PROCESS FOR THE EXTRACTION OF ATROPINE.

By A. W. GERRARD, F.C.S.

Having to conduct numerous estimations of the atropine contained in belladonna plants, and having tested the various methods recommended for its extraction, with indifferent success, most of the published processes yielding a very impure product, I have after several experiments devised a process giving me considerable satisfaction, yielding the atropine well crystallized and in a state of purity.

In most published processes for working out atropine, potassic hydrate or carbonate are the salts invariably employed or recom-

mended for its liberation, chloroform as its solvent, and alcohol as a crystallizing medium; but, however carefully the process may be conducted, the atropine is never obtained well crystallized, but as a brown, waxy, ill-defined mass.

In conducting previous investigations for the elimination of alkaloids, I have always found the employment of potash salts most objectionable, preferring above them ammonia. Potash causes colouring matters to become more soluble in chloroform or ether than when ammonia is used, thus increasing the difficulties of purification. Potash likewise produces a troublesome emulsion, slow to separate, and the yield of alkaloid has never been so high as when ammonia was employed. The explanation of this latter may be, that chloroform and ether being held more powerfully and permanently in solution by potash than ammonia, a loss of alkaloid takes place having some relation to the amount of chloroform or ether dissolved. Again, ammonia has certainly this great advantage over potash, that it is not known to decompose the alkaloid, and excess can readily be eliminated without injury to the product sought.

Lefort (*Journal de Pharmacie et de Chimie* [4], vol. xv., p. 417) gives one of the best published processes for the extraction of atropine, employing acidulated water for the exhaustion of the belladonna plant; to this I have some objections, preferring simple alcohol for the following reasons. With spirit a smaller volume is required to exhaust the drug, and therefore a less exposure to the deleterious influences of heat is required for its removal, spirit distilling or evaporating at a much lower temperature than water. Neither is there any necessity for the use of acid (a practice now being abandoned by other experimentalists), as the natural salt of atropine is equally soluble without as with it; this I demonstrated by three experiments each way, the yield of alkaloid being practically the same in either case.

The details of my process are as follows:—Pack 1,000 grams of well powdered belladonna leaf or root in a percolator, and allow it to macerate twenty-four hours with 1,000 c.c. of 84 per cent. alcohol; now add in parts of 250 c.c. at intervals of about four hours another 1,000 c.c. of alcohol; when percolation ceases displace with water, recover the alcohol by distillation, and treat the extract with five times its volume of water; carefully separate the resin and fatty matter and wash it twice, mixing all the washings; evaporate them to 300 c.c., and add a good excess of ammonia; expose in a shallow dish for some hours that excess of ammonia may volatilize; now shake well with an equal volume of ether, separate the ether and

withdraw the atropine from it by shaking with a small volume of water and repeated additions of acetic acid. Working in this way the ether may be used continuously to extract the mother-liquor until it is exhausted. The acetic solution of atropine is now shaken with and filtered through a little animal charcoal, concentrated to a small volume, treated again with ammonia and dissolved out a second time with ether. Allowing the ether to spontaneously evaporate, the atropine will separate in exceedingly fine filamentous crystals of a satiny lustre and almost white. Two more crystallizations will render them quite white.

In conducting this process it is important to remove the whole of the alcohol from the tincture, also to employ ether free from alcohol.

REPORT ON THE ALKALOIDAL VALUE OF CULTIVATED AND WILD BELLADONNA PLANTS.

BY A. W. GERRARD, F.C.S.

An opportunity having occurred to obtain considerable supplies of wild grown belladonna, I have utilized the occasion by instituting a comparative examination of the differences, if any, existing between it and the cultivated kind.

The wild belladonna, upon which my experiments have been conducted, was grown at Lastingham, near Pickering, Yorkshire, in a very poor, limestone soil, incapable of producing ordinary cultivated crops, in which, however, the belladonna luxuriates, reaching 6 feet in height. For its collection and selection, I am indebted to Dr. Sydney Ringer. As well as I could judge by comparison, its age was three or four years.

The cultivated plant was grown by the well-known firm of W. Ransom, of Hitchin, on a chalk subsoil, with 12 inches of stiff loam on the surface. The plants were 3 to 4 feet in height, and believed to be three years of age.

The entire plants were sent me immediately after collection, the wild towards the end of September, the cultivated at the beginning of October. At this period of the year, I am informed by Mr. Ransom, it is considered less active than during July, which is the month of flowering. The wild plant, by reason of the distance it had to travel, did not arrive in such good condition as the cultivated, it having lost its green colour and freshness, but was otherwise uninjured. Both kinds were dried at a temperature of 100° F., and divided into its various parts of root, stem, leaf, and fruit, and well

powdered, each part being then separately estimated for its percentage of alkaloid by the process described by the author (*Pharm. Journ.*). The result, as tabulated, shows, besides the comparative strength of the two kinds, also the distribution of the alkaloid in various parts of the plant, and it is worthy of notice that, in both cases, more is obtained from the leaf than the root, this being contrary to the general belief.

The alkaloid in each case was dried over sulphuric acid, and weighed as absolute alkaloid in nearly colourless crystals. In the residues there always appeared a small portion of alkaloid, seemingly different to atropine, being more soluble in water, and more readily volatilized. I hope to turn my attention to this observation on some future occasion.

Alkaloidal value of cultivated and wild belladonna plants:—

| Wild Plant. | | Cultivated Plant. | |
|-------------|-----------------------------|-------------------|-----------------------------|
| Part used. | Percent. yield of Alkaloid. | Part used. | Percent. yield of Alkaloid. |
| Root | ·45 | Root | ·35 |
| Stem | ·11 | Stem | ·07 |
| Leaf | ·58 | Leaf | ·4 |
| Fruit | ·34 | Fruit | ·2 |

So far this examination demonstrates that the wild plant is richest in alkaloid, and has the highest value; but it should be mentioned that the cultivated plant was of excellent quality, that is, judged by commercial belladonna leaves, three samples of which I had previously examined, yielding respectively ·07, ·11 and ·22 per cent. of alkaloid.

It would at present be only speculative to assign any reasons for the differences here shown in the two varieties, but it would appear that a soil of chalky formation favours the development of the alkaloidal principles, for it is a notable coincidence that both plants examined were grown upon chalk, and both are rich in alkaloid; but in that soil where the chalk preponderates, the plants are shown to reach the highest perfection.

As regards commercial belladonna leaves, I should infer that most of them were the growth of a soil unsuited to them; otherwise they must undergo considerable deterioration by keeping, for in no case have I been able to obtain so good a yield of alkaloid from them as from recent leaves.

Further experiments are yet required to substantiate the above views, and to assist me I shall be glad to receive communications from gentlemen who could direct me where to obtain belladonna plants from other than chalky soils.

It is my intention to continue these observations, and estimate the amounts of alkaloid present in the leaves and root of the plant at the period of flowering, if possible up to the sixth year of its growth.

The following is a report on the alkaloid from wild belladonna, by John Tweedy, F.R.C.S., Professor of Ophthalmic Surgery to University College:—"I have made a large number of comparative experiments with the two solutions of atropine you gave to me some weeks ago. As the result of my observations, I may say that in every instance I found the atropine from the wild plant more prompt in its action and more energetic, that is, it dilated the pupil and suspended the power of accommodation quicker, and its effects lasted longer. I am inclined to think that the solution of the atropine from the wild plant was, likewise, less irritating than the other. This may have been due to the greater purity of the alkaloid prepared by yourself, whereby it contained a larger proportion of hyoscyamine.

"I may add, as a curious fact, that the solution of the atropine from the wild plant has kept better than the other. This difference has been observed in three different portions preserved in separate bottles. The commercial plant already contains a large quantity of fungus, while the other is still free.

"As far as I know each specimen has been preserved with equal care."

A vote of thanks was passed to Mr. Gerrard for the above papers.

Mr. NAYLOR said it appeared to him that the numbers given were very near, and considering the method by which Mr. Gerrard had extracted this very pure atropine, he was not sure whether the differences might not almost be considered errors of experiment. But he understood he had adduced physiological evidence as well.

Mr. ALLEN said he was able to confirm Mr. Gerrard in an observation he made incidentally, that the ether was more soluble in liquids containing caustic alkalies than ammonia. If soap containing a considerable excess of caustic potash or soda were mixed

with ether, the amount of ether dissolved was something very considerable.

Mr. PLOWMAN asked whether the percentages were calculated on the dry portions of the plant, or upon the plant in the green state.

Mr. GERRARD said on the dry plant.

Professor ATTFIELD asked if Mr. Gerrard had taken any means to ascertain that the extremely beautiful article he had produced was atropine and nothing else. From the experiments he had described, made by his physiological friend, it would seem there was a possibility of something else being present. He presumed that was one of the questions he would investigate, giving the result at some future time.

Mr. CLEAVER wished to ask if Mr. Gerrard tried any means of determining the total amount of the alkaloid present, otherwise than by direct estimation. He had been working on a somewhat analogous research on a different subject, and found that although a plant indicated by Meyer's solution that it contained a considerable proportion of alkaloid, it was extremely difficult to realize anything like that percentage when worked out on the manufacturing scale, and he should like to know whether other observers had noticed the same thing. With reference to Mr. Naylor's observation, it was very easy indeed to work on the process indicated by Mr. Gerrard with great accuracy, and the difference between .58 and .4 could not very well be an error of experiment.

Mr. SHENSTONE wished to confirm Mr. Gerrard on the point of using ammonia in extracting alkaloids. He had found ammonia was much better than either caustic potash or soda. He might say that it lent itself to what he believed to be a novel method of treatment, which he had found of great convenience. Everybody knew how difficult it often was to separate alkaloids in the crystalline state from liquids containing the semi-resinous semi-gummy substance which was so common. Ammonia, if applied very gradually, aided very much in dealing with such cases. He had worked in this way on the alkaloids of *nux vomica*, for instance. He placed a slightly acidified solution of the alkaloid in a flat dish, and in the centre of that, upon a beaker, a shallow dish containing some dilute ammonia, and covered the whole up for a week. Working in that way the alkaloids, instead of coming out as a sticky, gummy, unworkable mass, would come out in distinct crystals and save a great deal of trouble. He did not know how far this method was new, but he had not seen it mentioned. He observed that Mr. Gerrard's results seemed to differ from those of a previous experi-

menter; he rather thought the French chemist, Lefort, found that the wild belladonna grown around Paris contained nearly the same proportion of alkaloid as the cultivated plant grown in the same district.

Mr. M. W. WILLIAMS said, as he understood, Mr. Gerrard extracted the plant in alcohol, distilled down the alcohol, and got, he presumed, a more or less watery extract; he then further diluted that with water, removed the resin by some process of filtration and decantation, washed the resin, and then added more water, and then had to evaporate in order to get rid of the excess of water. Now there was a simple process which entirely avoided both the subsequent addition of water and the washing of the resin and the evaporation. The evaporation of a watery solution of alkaloid containing other things than mere water was very disadvantageous; and if he would distil down his alcoholic extract into a watery extract, at the end he could eventually, by very gentle temperature, get rid of the whole of the alcohol, and if to the watery solution he added a few drops of acetic, tartaric, or some other weak acid, not likely to act on the alkaloid, and shook it with petroleum ether, the resin could be removed without the necessity of subsequent evaporation. It had frequently been noticed that in the dry flowers of plants there was a very large proportion of alkaloids, for instance, aconite; Dragendorff and some other people found no less than 7 per cent. of the dry matter of the flowers consisting of aconitine. In the figures given there was nothing like such a percentage as that. Mr. Allen had mentioned that a potash solution dissolved ether much more readily than plain water or ammoniated water, and the reason for that, he thought, was sufficiently obvious to those who were aware of the tension dissociation, and of the relative surface tensions to the solutions of liquids like those. The potash diminished very little the surface tension of water, but on the contrary ammonia diminished the surface tension considerably. Mr. Allen had suggested that if hydrochloric acid were added to a potash solution of ether, there would be a separation of the ether; that was no doubt so, but the separation of ether would take place almost equally if a large quantity of caustic potash were added for a similar reason—it was a process of salting out.

Mr. SHENSTONE wished to add that the use of ammonia in the way he had just described could only be employed with an alkaloid fairly insoluble in water, and no doubt, therefore, Mr. Gerrard might point out that it would not apply in this case.

Mr. GREENISH said from a pharmacist's point of view this was one of the most interesting papers he had heard for some time. The fact that the leaf of the belladonna contained more of the alkaloid than the root was very remarkable. It would be recollected that at the last Conference, Mr. Naylor read a most interesting paper on the extract of henbane, when he mentioned that the softer parts of henbane were used as well as the leaf, following in the steps of Mr. Squire in that direction. Mr. Squire also entertained a very strong opinion that the root of the henbane was more active than the leaf. Shortly after the Conference at Swansea, he had occasion to go to Russia, and when in the laboratory of Professor Dragendorff, he asked him if he had ever made experiments of the quality or activity of different parts of the hyoscyamus plants. The Professor gave him a pamphlet containing the results of a series of experiments conducted in his own laboratory, showing that the leaf contained the greater proportion of hyoscyamine; the roots, the flowers, and the stem each containing only a small proportion. He was exceedingly pleased to find from Mr. Gerrard's experiments that the same thing obtained in belladonna. He felt that pharmacists had been making some mistake in using the root, and considering it was more active than the leaf. It seemed to him they must again return to the old practice of using the leaf, the same as henbane.

Mr. SYMES said in Mr. Gerrard's first paper he stated that he objected to the use of an acidulated menstruum for separating the alkaloid, because it was equally soluble in a neutral fluid. He presumed that would apply simply to an alcoholic menstruum, and not to an aqueous one. That the alkaloid itself was much more soluble in an acidulated fluid than in water was well known; but if Mr. Gerrard used alcohol, probably the alcohol would be as good a solvent without the addition of acid as with it.

Mr. GROVES said with reference to the late researches of Ladenburg and others, to the effect that the atropine of commerce was composed of two distinct alkaloids, atropine and atropidine, or A and B atropine, he did not know whether Mr. Gerrard had reason to suspect the occurrence of two distinct alkaloids, but it seemed to be made out that these two did exist, and that atropidine was in fact hyoscyamine. It was pointed out that it would be futile to attempt to extract hyoscyamine from hyoscyamus plants when it could be obtained with so much greater facility as atropidine yielded by belladonna plants.

Mr. GERRARD said he had mentioned the probability of there being a second alkaloid.

The PRESIDENT said that before Mr. Gerrard replied he would just allude to the paper of Mr. Merck, read on the previous day, which might be considered as confirming Mr. Gerrard's supposition of there being two alkaloids. What had been said of the greater amount of the alkaloid contained in the leaves, both of *hyoscyamus* and *atropa belladonna*, had a distinct interest for pharmacists. The use of the root was a comparatively recent innovation, and did not appear as though it would stand the test of experience. It was also open to the objection that it entailed the destruction of the plants, and therefore it was very useful to know that the leaves were as good or better. The hyoscyamine of Mr. Merck was made from the leaves.

Mr. CARTEIGHE said that Mr. Merck had had the advantage of Professor Ladenburg's assistance, who devoted himself entirely to the subject of these mydriatic alkaloids. In Mr. Gerrard's case he had a good deal of other work to do, and the Conference must feel very grateful to him for undertaking these quantitative experiments. He might, however, suggest to Mr. Gerrard to so far modify his paper as to insert the words "or of total alkaloids" after "atropine." This would not at all detract from his work, which was to show first that the total alkaloids were easily extracted by his process from the root, stem, or leaf; and secondly, that the proportion in the cultivated and wild variety differed. He confessed he was not quite satisfied from the small number of experiments made that Mr. Gerrard had yet proved his case. As this was a preliminary paper, he would not pursue that matter further, but any one who had attempted the quantitative experiments involving the drying of specimens of this kind very carefully first, and then the drying of the crystals, and so on, would know that an error of a very minute kind in the process would materially affect the percentages, and therefore it was a little difficult to come to a conclusion on the subject from this species of experiments. It was a very important subject, and it would be a great gain to chemistry proper and chemical physiology, if Mr. Gerrard could find time to settle the point definitely at a future meeting. The question was very similar to that of determining the total alkaloids in cinchona barks. The actual separation of alkaloids was an after consideration.

Mr. GERRARD, in reply to Mr. Naylor's remark on the close approximation of the percentages, said he gave them exactly as they came out, and therefore he thought it was rather cavilling to raise the point that the difference between them was small. Then Mr. Allen asked the amount operated upon.

Mr. ALLEN said he thought it would be an answer to Mr. Naylor if Mr. Gerrard had used a considerable quantity of material.

Mr. GERRARD said he used a kilogram in each case.

Mr. ALLEN said that made a very substantial difference.

Mr. GERRARD, continuing, said Professor Attfield had asked whether it was atropine or not he obtained from the plant. He did not tie himself to that statement definitely, knowing the uncertain state of the question as to whether it was atropine only contained in these plants yielding mydriatic alkaloids. He was utterly unable to state whether what was now being dispensed as atropine was atropine, hyoscyamine, duboisine, or daturine. In reply to Mr. Cleaver, he very much preferred to measure the alkaloid he obtained as alkaloid absolutely, not as any combination either with Meyer's reagent or double iodide of bismuth and potassium, because he was sure those reagents precipitated other bodies besides alkaloids, and therefore did not give exact results. The result obtained by Meyer's solution led one to infer there would be a larger yield of alkaloid than was really obtained. Mr. Williams had made a reference to the employment of petroleum ether so as to avoid the use of an excessive quantity of water, and thus some evaporation. Now, in evaporating or distilling an alcoholic extract of belladonna, after the removal of the whole of the alcohol carefully at a lower temperature as he suggested—which was the process he employed—if the extract were allowed to stand it would separate into two portions, one of which contained a much larger proportion of alkaloid than the other. The substratum, or the aqueous portion, would contain the main portion of the alkaloid, and the upper portion was principally a resinous, oily matter, still containing alkaloid. If petroleum ether were used to remove it, and rejected, alkaloid would be thrown away; but if it were washed two or three times with water, the alkaloid would be saved. For that reason he preferred washing the resinous matter with water. Heat probably had some effect on the small quantity of alkaloid present, nevertheless that was unavoidable. He considered that there was no advantage in the use of petroleum ether. He had used it in some cases, but practically it was not available for all, as it did not dissolve all the resin. Mr. Symes spoke of the employment of acid to dissolve atropine, and he was right so far as free atropine was concerned; but he did not think acids increased the solubility of salts of atropine, and it existed in the plant probably in combination with malic acid, and not as a hydrate, therefore there was no advantage in the use of acid, whether water or alcohol were the solvent employed.

The next paper read was entitled—

FURTHER NOTES ON SHALE AND PETROLEUM PRODUCTS.

By ALFRED H. ALLEN, F.I.C., F.C.S.

It will be in the recollection of many of those present that, at the Swansea meeting of the Conference I described some experiments showing that the various commercial products derived from petroleum differed from the parallel series of products obtained by the distillation of bituminous shale. The differences there described included the behaviour of the products in question with fuming nitric acid, and their solvent action on pitch and absolute carbolic acid. The differences observed were attributed to the presence in the shale products of a larger proportion of hydrocarbons of the ethylene series, having the general formula $C_n H_{2n}$, than existed in the parallel products from petroleum. Some doubt has been expressed as to the existence of the supposed difference of composition, and, therefore, with a view of placing the matter beyond the possibility of further question, I have made some additional experiments in a new direction.

One of the best known and most characteristic properties of the olefines, or hydrocarbons of the ethylene series, is the readiness with which they enter into combination with bromine to form additive compounds of a stable and definite character. The paraffins, or hydrocarbons of the marsh-gas series, on the other hand, do not form additive compounds with bromine, and are practically unaffected by it under the ordinary conditions of experiment.

Combination with bromine has long been used for assaying coal-gas for the proportion of ethylene and allied hydrocarbons contained in it, and has also been previously employed in the examination of shale products. I have, however, been unable to learn the precise manner in which it has been used for the latter purpose, and, as I at first met with considerable practical difficulties in applying it quantitatively, it may be of interest to describe the plan which I ultimately adopted, and by which such numerical results as I shall lay before you have been obtained.

A solution of hypobromite of sodium is prepared by measuring out 40 c.c. of bromine, gradually adding solution of caustic soda (avoiding any rise of temperature) till the liquid is slightly alkaline, and of a light yellow colour, and then diluting the liquid with water to one litre. The strength of this solution is then ascer-

tained by measuring out 20 c.c., diluting with about 150 c.c. of water in a porcelain dish, adding a strong solution of pure iodide of potassium, and then acidulating the mixture with hydrochloric acid. If any black precipitate of iodine occur, more potassium iodide solution is added till the mixture has a clear brown colour. The iodine set free is then titrated with decinormal solution of sodium hyposulphite (24.8 grams of crystallized $\text{Na}_2\text{S}_2\text{O}_3$ per litre), each 1 c.c. of which, if of accurate strength, corresponds to .0080 gram of bromine in the 20 c.c. employed for the experiment.

The end of the reaction is indicated by the disappearance of the brown colour, and may be rendered still more sharp by adding a few drops of starch solution towards the end of the titration.*

Five grains, or 5 c.c. of the sample of mixed hydrocarbons to be tested, is next placed in a small tapped separator, or Mohr's burette with a glass tap, 5 c.c. of the bromine solution added, the mixture acidulated with dilute hydrochloric acid, and well agitated. The liberated bromine will be dissolved by the hydrocarbon, which in most cases will combine with it to form a bromide, or be acted on with production of a bromo-substitution product. In either case the red colour of the free bromine will disappear partially or completely. If on standing a minute or two the layer of hydrocarbon be found to have a marked red or yellow colour, the bromine treatment is at an end, but otherwise a further addition of a known measure of hypobromite solution is made, and the agitation repeated. Excess of bromine solution having been added, as indicated by the permanent red or yellow colour of the hydrocarbon layer, the mixture is allowed to rest a few minutes to permit the aqueous liquid to separate. In most cases this occurs readily, but in others the brominated oil adheres to the sides of the vessel, and, if of about the same density as the aqueous liquid, only separates with great difficulty. In such cases it is desirable to add sufficient petroleum spirit to cause the hydrocarbon to rise readily to the surface. This plan never fails. The petroleum spirit employed may be ordinary commercial "benzoline," but it must be previously agitated with enough bromine water to render it permanently coloured, and then with sufficient soda to decolorize it. Treated in this manner, it is rendered indifferent to bromine.

Complete separation of the two layers having been effected, the aqueous liquid is run off through a tap into a porcelain basin, and

* In the analysis of shale naphtha, 5 c.c. measure of the sample often requires an addition of 25 c.c. of bromine solution to effect complete bromination.

the brominated oil is shaken with sufficient solution of caustic soda to render it colourless. The soda solution is run off into the porcelain basin, the oil washed by agitation with a little water, and the washings run off in their turn. Iodide of potassium is then added to the liquid in the basin, and sufficient hydrochloric acid to render it distinctly acid. The mixture is then titrated with hyposulphite in the same manner as the bromine solution. The quantity of bromine thus found is the excess employed, and if deducted from the total quantity present in the volume of hypobromite solution added to the oil, the weight of bromine will be found which is required to combine with the quantity of hydrocarbon taken for the experiment.

When a solid hydrocarbon, such as vaseline or paraffin wax, is to be examined, two grams of it should be dissolved in the smallest quantity of petroleum spirit (previously brominated as already described), and the solution so obtained treated in the usual manner.

Operating in the manner above described the method gives very constant results. The following figures show the proportion of bromine which I found to react with samples of representative commercial products consisting wholly or chiefly of hydrocarbons. In nearly all cases the numbers given are the mean of two or more concordant experiments.

| Substance. | Sp. gr. at 15.5° C. | Grams of bromine combining with 100 grams of sample. | Percentage of bromine of product. |
|---|------------------------|---|---|
| Naphthas— | | | |
| 1. Gasolene from shale | ·665 | 67·1 | 41·6 |
| 2. Gasolene from petroleum . . | ·652 | 5·1 | 4·8 |
| 3. Shale naphtha | ·718 | 94·9 | 48·7 |
| 4. Petroleum naphtha. | ·690 | 10·0 | 8·8 |
| 5. Benzol. | ·876 | 36·2 | 26·6 |
| Burning Oils— | | | |
| 6. From shale | ·801 | 38·7 | 27·9 |
| 7. From shale | ·806 | 36·1 | 26·7 |
| 8. From petroleum. | ·800 | 17·2 | 14·7 |
| Lubricating Oils— | | | |
| 9. From shale | ·889 | 56·4 | 36·0 |
| 10. From shale (bloomless) . . | ·875 | 45·8 | 31·2 |
| 11. From petroleum (spindle valvoline) | ·862 | 21·6 | 17·7 |
| 12. From petroleum (oleo- naphtha). | ·905 | 31·8 | 24·1 |
| 13. Rosin oil | ·973 | 45·3 | 31·2 |
| 14. Refined rosin oil | ·978 | 42·7 | 29·9 |
| Solid Product— | | | |
| 15. Vaseline | | 19·7 | 16·5 |

From these results it will be seen that there is in each case a striking difference between the proportion of bromine assimilated by any of the shale products, and the quantity which combines with the parallel product from petroleum. Thus, while the shale naphtha took up nearly its own weight of bromine, the petroleum product combined with only 10 per cent., and the gasolenes, burning oils, and lubricating oils exhibit similar but less striking differences. Benzol does not give a satisfactory result, the reaction with bromine occurring slowly instead of instantaneously, as in the case with the shale and petroleum products.

Owing to the complex character of commercial hydrocarbon products, a determination of the amount of bromine combining with them does not give the means of calculating the percentage of olefines present in them. If, however, a fraction of constant boiling point were prepared, and its vapour density ascertained, its mean combining weight could then be deduced, and then a determination of its power of assimilating bromine would give a means of obtaining a close approximation to the proportion of olefines contained in the fraction. The suggestion assumes the absence of hydrocarbons of the acetylene series and other bodies simulating the olefines in their reaction with bromine.

I may point out that recent researches have thrown considerable doubt on the assumed presence of a large proportion of paraffin hydrocarbons in petroleum. Indeed, their presence in the Caucasian product is denied, and in American petroleum they are said to have been confounded with the hexahydrides of the hydrocarbons of the benzene series, $C_n H_{2n-6} H_6$, which resemble the paraffins, $C_n H_{2n+2}$, in being unacted on by bromine, and cold nitric or sulphuric acid, but are oxidized by hot fuming nitric acid. Whether this series of hydrocarbons is present in shale products also is a subject for future research.

My acknowledgments are due to Mr. W. L. Gunn for the valuable assistance he has afforded me in connection with the experiments described in this paper.

A vote of thanks having been passed to Mr. Allen,

Mr. EKIN said Mr. Allen referred to the fact of petroleum containing hydrocarbons of the benzole series, but with the formula $C_6 H_{12}$; he supposed he did not mean benzole itself. He believed it was a matter of fact that it was found to yield not only benzole, but also toluol and xylol in such quantities that a company in the United States was now formed to isolate those hydrocarbons. He

did not think it was an American *canar* merely, because he knew it had rather frightened the manufacturers in this country. Nitrobenzole and binitrobenzole were made by thousands of tons, and it would affect English manufacture very considerably. He did not understand that Mr. Allen had quite satisfied himself that he had found benzole amongst these products.

Mr. NAYLOR asked if the $C_6H_6H_6$ was capable of splitting up under distillation, under pressure, in the same way as the paraffins did.

Mr. ALLEN said he had perhaps not quite made himself understood with regard to the benzole series. It was unquestionably the case that you could obtain nitrobenzene and nitrotoluene—nitrobenzol and nitrotolulol, by treating American petroleum with nitric acid. He had done it repeatedly himself, and had made aniline from it. Whether that came from preformed benzene or whether from benzene hexahydride, he did not know. He was not able either to answer Mr. Naylor as to what happened to these things at a high temperature. At any rate it seemed highly probable that they would all undergo such a change, and that these companies which had been formed might rely on that fact. At the same time it was new to him to learn that an American company had done it. He heard of a Russian company, because the Russian petroleum contained a larger quantity of these constituents. No trace of benzene and of aniline could be got from shale products.

The following three papers were then read and discussed together—

ON RED BARK.

By JOHN ELIOT HOWARD, F.R.S., F.L.S.

In order to present more definitely the results of recent information on this subject, together with some suggestions for discussion at the Conference, I must (in some sense) begin at the beginning and show what I mean by "Red Bark."

The limitation of the genus *Cinchona* to those plants which have capsules dehiscent from the base towards the apex seems to me most correct and natural. I think my friend, Professor Karsten, has done good service to quinology, not only by the magnificent and unique plates and descriptions, in his splendid volumes, of the *Cinchona cordifolia* and *C. lancifolia* (for instance), but also of the

lesser known group which he includes to my regret under the same head of *Cinchonas* (*Cinchona, sectio Heterasca*).

These have capsules variously dehiscent, though in other respects closely allied to the *Cinchonæ*. I have recently met with specimens of the bark of two of these, together with leaves and, in one case, very well preserved capsules, evidently of the *Cinchona pedunculata*, Karsten. The other I referred, with less certainty, to another of his species, *C. undata*, Krs.

I was informed that neither of these barks, when examined by Dr. Paul, manifested any trace of alkaloid. Is not this a reason (if confirmed) for the limitation of the term *Cinchona* to those plants which, having the capsules dehiscent from the base, also possess the medicinal properties from which the name is derived? To these alone it seems properly to belong.

When we come to the definition of species, the difficulty of discrimination increases so much that some (even of those who are interested in the cultivation) seem inclined to throw up the whole subject in despair, and to believe in unlimited hybridity and change, instead of that exact fixedness of type which, at all events since the researches of the early Spanish botanists, have marked the South American species. Pavon especially was very careful in his selection of specimens, so that out of forty-one sorts which I possess of his collection, I am able to recognise at least twenty-eight as met with in commerce, and as like as if they came off the same trees.

I have thus found amongst the barks of commerce, the bark of most of the species described by Pavon and his associates, and by Mutis and Zea, exactly reproduced with every minute feature. I have had the satisfaction of cultivating many, and of receiving specimens from the native habitats and the adopted countries of many others, and my conclusion is that fixity of type is the rule, and variability the exception. I do not deny that this latter occurs (through hybridity) in India; but I agree with the late Dr. Weddell in thinking that there is not usually much opportunity for this in South America. I can add that Dr. Weddell's specimens are admirably true to type.

Even in India the probability is that many of the variations observed are connected with the following characteristics, observed first by the Spanish botanists, and which I will now briefly explain.

All the different species of *Cinchona* (so far as observed) exist under different, slightly varying forms, of which it seems impossible to say that any one is the original species and the others varieties. For instance, I have now, growing from seeds gathered by the

diligent collector, Robert Cross, two forms of the *Cinchona cordifolia*, from two different localities; one of which, from a place called Coralís Inza, possesses the true cordate form of leaf as represented by Karsten in his plate of *Cinchona cordifolia*; the other, though equally in its marked characteristics the "hard Carthagena" or "cordifolia" bark of Mutis, does not yet show one leaf true to the type. The Coralís Inza form is much richer in quinine, and has consequently (at my recommendation) been transplanted by Mr. Cross to India, where I hope it may prosper, and perhaps be found useful.

Having premised these observations, I now come to the question of "Red Bark," of which the true species is, as defined by Pavon, the *Cinchona succirubra*, so named by this botanist from the peculiarities of the juice, which he defines as follows:—

"In arboreum corticemque amputatione succum lacteum primum profluit; postea in colorem intense rubicundum transmutatur, unde *cascarilla colorada* nomen oritur."

That is to say, it is named "Red Bark" (in Spanish as above), from this peculiarity in the juice. True Red Bark is, as I have shown in my "Illustrations of the Nueva Quinología," the product of *Cinchona succirubra* of Pavon. But *C. succirubra*, like other species, exists under somewhat different forms, as will be seen by examination of the specimens I send to illustrate the subject.

One source of variation is connected with the *macho* and *hembra* forms of the same plant; that is to say, the preponderance of the male and female elements in the flower, attended, as well shown by Dr. Weddell, with corresponding changes in the rest of the plant. The colour of the flowers, for instance, varies in its intensity. Another contrast between different forms is found in the perfectly glabrous or subpubescent under surface of the leaf. This, as defined by Pavon, and as found generally in India, is perfectly smooth. As defined by Klotsch, it is *foliis subtus puberulis*, judging (as he did) from a specimen of Pavon's in the Berlin Museum.

These differences, apparently trivial, are nevertheless important to the cultivator; the pernicious effects of the rapid oxidation of the cinchotannic acid I have explained in the "Nueva Quinología," so that we may fairly say, the more truly *colorada* or *red* the bark, the less probability there is of good results in the alkaloids. I send for the Museum small specimens—(A) of Pavon's own collection; of the genuine Red Bark (B) in commerce; and of the more resinous sort (C), which I have described in the above work, as they used to be imported from South America; fetching a high price,

but useless to the quinine manufacturer, containing in each case about 2 per cent. of alkaloids, the most predominant, cinchonine and cinchonidine. The truest Red Bark in India will come to this by age. The state of degeneration which I have described (at p. 14, *sub voce C. succirubra*) was believed by Mr. Broughton to have set in during the continuance of his observations, and I have recently had the opportunity of examining specimens, carefully selected by Mr. Cross from the Government Gardens at Ootacamund, which present the much more mature bark as exhibiting the true characteristics of genuine Red Bark, both in physical characteristics and in the nature of the alkaloids it contains.

I have forwarded specimens of these (D), No. 19 and No. 20, as sent by Mr. R. Cross, with the following information :—

Analysis of No. 19.

Quinine, .91 per cent. = sulphate of quinine, 1.21 per cent.

Cinchonidine, 1.43 per cent.

Cinchonine, 3.84 per cent.

Amorphous alkaloid, 1.14 per cent.

Analysis of No. 20.

Quinine, .86 per cent. = sulphate of quinine, 1.15 per cent.

Cinchonidine, 2.08 per cent.

Cinchonine, 3.66 per cent.

Amorphous alkaloid, 1.06 per cent.

On these barks I have remarked thus in a recent report to the Marquis of Hartington :—

“Both these are most characteristic specimens of Red Bark, and the produce well illustrates the mistake, which I have constantly pointed out, of the excessive cultivation of this species. The bark of such trees can only be made serviceable by ‘renewing’; otherwise the oxidizing process goes forward to the ultimate destruction in old trees of almost all the alkaloids.”

In the same report I have particularly contrasted with the above, Mr. Cross's No. 18 (E) as follows :—

“Under No. 18 I find valuable information. This is called ‘Red Bark,’ but is, indeed, not Red Bark at all, but, as described by the Spanish botanists, ‘cinnamon-coloured bark’ (*acanelada*). According to these authorities, when the trunk is wounded a clear juice flows out, which changes to a *golden colour*.” (See my “*Nueva Quinologia*” under head of *C. coccinea*, *vulgo cascarilla serrana acanelada*, y *Pata de Gallinazo*.)

"*Truncis inoisis, succum crystallinum exudant, posteaque in aureum colorem convertitur.*"

"Under similar circumstances the *C. succirubra* yields a milky juice which changes to an intensely red colour. . . . It is rightly named by Cross, *Pata de Gallinazo*."

I published information on both these barks in 1862, and my work was sent out by the Government to, I suppose, all the stations, but apparently we have these *two* species still united under the designation of *C. succirubra*. I know not to what extent the species prevails in India, but it is satisfactory to believe that it is a much better sort for cultivation than that with which it is confounded, as is shown by the following analysis of (E):—

Quinine, 2·27 = quinine sulphate, 3·03 per cent.

Cinchonidine, 3·21 per cent.

Cinchonine, 3·17 per cent.

Amorphous alkaloid, ·93 per cent.

But we have not only *two* but *three* species confounded under the heading of *C. succirubra*, as I have convinced myself by comparing together the specimens which I send, together with information from Mr. R. Spruce, the collector of the seed for India, also from the late Mr. McIvor, and from examination of specimens of bark from India and also quite recently from St. Thomas.

This is the *cuchicara*, or "pig's skin sort" of Red Bark, little valued in commerce of old, the appearance being against it, but apparently of greater value than the true Red Bark as regards contents in alkaloid. See specimen (F) and analysis.

Analysis of Bark from St. Thomas.

| | Quinine Sulph. Per cent. | Quinine. Per cent. | Cinchoni- dine. Per cent. | Cinchonine. Per cent. | Amorph. Per cent. |
|---------------------|--------------------------------|-----------------------|---------------------------------|--------------------------|----------------------|
| Large quills . . . | 2·86 | 2·14 | 3·26 | 2·49 | ·89 |
| Medium quills . . . | 2·31 | 1·73 | 3·16 | 2·28 | ·91 |
| Small quills . . . | 1·83 | 1·37 | 2·00 | 1·84 | 1·00 |

I will give in an appendix the remarks written by Mr. Spruce himself on inspection of the *C. erythrantha* of Pavon (as represented in my Illustrations of the "Nueva Quinologia"), which he says is probably true *cuchicara*.

According to Spruce the *C. conglomerata* and *C. umbellifera* of the "Nueva Quinologia" are probably allied species.

The propagation of so many millions of trees of what is called *C. succirubra* in India, against all cautions and in neglect of all the information I have been able to reproduce from the careful Spanish botanists, impresses on my mind very strongly the inquiry *cui bono* as to any information I am giving now and might be able to render hereafter.

I reflect, however, that amongst the private cultivators there are some who gladly avail themselves of the best scientific information they can obtain; and who will find in the end that they have done well to attend to the careful discrimination of the species, and also of the forms of the species, and in giving their attention to the cultivation only of those most adapted to their purpose.

From the observations of Mr. Spruce I do not suppose that it is easy for an unpractised eye to discriminate between these species when not in flower; but Mr. Cross writes to me that he alone saw the tree in its native *habitat*, and collected the plants at the foot of a precipice when in company with the son of a cascarrillero. It is, at all events, rather late now to attempt any separation. The seed of the different species has been put by the collectors into the same bags, so that all is uncertainty. The Jamaica sort seems to me to represent very perfectly the subpubescent type of the true *C. succirubra*, according to the specimen described by Klotzsch. It is, moreover, richer in alkaloid than the average Red Bark of the East Indies, which for the most part (but not without exception of better qualities) must belong to the glabrous type.

I have now growing a plant of a kindred sort, the *var. pubescens* of McIvor, and am not disinclined to think that it may be, after all, one of the cognate species as mentioned above, instead of a hybrid. If I can succeed in getting it to flower, I shall perhaps be able to solve the question.

Professor Trimen, Director of the Royal Botanic Gardens, Ceylon, says in Report for 1880:—

"I have also received from the Government plantation at Nediwuttum, Nelgiris, a Wardian case with some young plants of the kind called* *C. officinalis*, *var. pubescens*, by Mr. Howard, but considered a hybrid by the late Mr. McIvor. Owing to the remarkably careless packing these were nearly all dead on arrival, but a few have survived and are doing well. They possess much the appearance of *C. succirubra* at present."

* I simply suggested it being called "*var. pubescens*," looking upon it as a *hybrid*. It is quite unlike *C. officinalis*. It would be better to call it (simply) "Howard's sort."

I am informed by a private cultivator in Ceylon, that it forms a handsome tree, differing in its mode of growth from *C. succirubra*. (See Appendix.)

Another planter tells me he has of this sort, which he identifies with the tree in my possession, not less than 300,000 plants in various stages, from which he expects great results.

I must now draw to a conclusion this, I fear, rather prolonged paper, by suggesting as a subject for discussion, what is the difference in therapeutic efficacy between pharmaceutical preparations of *C. succirubra* and *C. officinalis*?

It is probable that in future these will almost exclusively be made from the barks grown in India, and at present the former seems to be the most recommended.

I cannot believe that the medicinal effect will be the same in both cases. I have before stated that the astringent principle shows an entire divergence in the two different barks as tested by various reagents. I am not aware that either in one case or the other any medicinal inquiry has taken place. The same observation may be made as to the remaining constituents of the *C. succirubra* and the *C. officinalis*, in the former case much more complicated than in the latter.

The supply of cultivated bark from South America will probably go entirely into the hands of the quinine manufacturers. This may also be the case with the best of the *C. officinalis*, but much of what is cultivated is of an inferior description.

I will not add anything respecting the relative constituents in alkaloids, but conclude with an observation of Lord Bacon (quoted by Dr. Kentish, one of the early writers (1784) on Peruvian bark), that mankind are far too apt to contemplate nature as if from the top of a tower, without descending to the investigation of details.*

Practically, however, the substitution of theory for scientific investigation is sure to lead to very unsatisfactory results.

In the present instance we have the following confusion:—

When "Red Bark" is spoken or written about, it may be the produce of—

(A). *C. succirubra*.

α. Glabrous form.

β. Subpubescent form.

* Solent autem homines naturam tanquam ex præaltaturri et à longe despicere, et circa generalia nimium occupari: quando, si descendere placuit, et ad particularia accidere, resque ipsas attentius et diligentius inspicere, magis vera et utilis foret comprehensio.—L. ii., cap. 1.

or—

(B). *C. coccinea*, Pavon (?). *Pato de Gallinazo*.

or—

(C). "Pubescent" sort of Howard.

or—

(D). *C. conglomerata*, Pavon, *casc. colorada*, producing, according to Cross, the *morada* sort of Red Bark, of which I send specimen [G].

or—

(E). *C. erythrantha*, Pav. (?), *casc. cuchicara*.

APPENDIX.

[Remarks written by R. Spruce on my *Quinologia*. "Notulæ ad *Quinologiam novam Spectandæ*, R.S."]

Cinchona.

"*C. coccinea*, Pav., *Pato di Gallinazo* (Ecuador).—Plainly the true *Pata di Gallinazo* of the Quitensian Andes, and seen by me in the very same localities (Chillanes, Guaranda), also in valleys of Pallatanza and Alausi. I could not distinguish it by the leaves alone from the *cuchicara*, growing along with it, but the Indians say they can always tell it. Its bark has some commercial value, that of the *cuchicara* none. The two agree in the very stout leaf veins, the corymbose inflorescence and the dull scarlet or brick-red colour of the flowers, quite different from the red or roseate hue of the flowers of most other cinchons.

"*C. erythrantha*, Pav., compared with the *Pata di Gallinazo* by Pavon himself, is probably true *cuchicara*. The acute venation and the locality (hill forests of Guayaquil and Jaen) seem to confirm this view.

"*C. conglomerata*, Par.—Except for the elongated panicle, this much resembles a pubescent form of the *cuchicara*."

APPENDIX.

[Extract from "*Nueva Quinologia*," *C. succirubra*, p. 14.]

"In the red bark it is to be remarked that the brick-red colour, which, as Ruiz observes, is not found in the growing plant, but in the dried bark, is really an excretory product of vegetation, a part used up and brought by contact with the air into a state in which it can no longer be serviceable to the living plant and from which it degenerates by a still further degradation into *humus*, as we have

reason to conclude, both from following out the above experiments on the changes of colours to their last result, and from observing analogous changes in the bark itself as it verges towards its latest stage. The pieces of flat red bark possessing the finest colour are generally remarkable for their specific lightness, having a texture analogous to that of wood that has lost its firmness by incipient decay. Indeed, it is by a process of *eremacausis* that the red bark acquires its colour; the cincho-tannic acid in which it abounds having become oxidized and changed into cinchona red, and under these conditions the alkaloids also appear to undergo some corresponding alterations. They are now implicated with resin, which appears to have also become oxidized so as to act the part of an acid, and is with difficulty separated; the chlorophyll has disappeared. Kinovic acid is still present; gum, which contributed to this so-called resinous character and was abundant in the bark of the smaller branches, has undergone a decrease. But the most remarkable feature is the altered conditions of the alkaloids themselves. Quinine, which formed a considerable portion of the whole, is now greatly diminished, cinchonine and cinchonidine remaining much the same. The total percentage has undergone no diminution, and an alkaloid, quinicine (?), which was either entirely absent from the smaller quills, or present in a feeble proportion, now appears in a notable quantity.

"This was the result of my observations on South American barks up to 1862. I then thought the total percentage of alkaloids had not diminished with age. The quinicine (?) I found associated with aricine (?) or perhaps the quinia (?) of Batka."

The chief part of this troublesome and noxious residuum I now suppose to be paricine (1881).

Correspondence as to the New Species.

In order to show at once the importance and the difficulty of this investigation, I add the following letters, which complete the history of the subject up to the present time.

I have written to India for more precise botanical details.

Description by a Planter of the Pubescent Species.

"This tree had a very thick stem, and the bark also was very thick. The foliage of the tree forms a perfect pyramid; the branches drooping down and then turning up at the ends. The leaves are of a dark green colour, rather round at the ends and very pubescent on the under side."

Analysis of Bark.

| Quinine. | Cinchonidine. | Cinchonine. | Quinidine. |
|------------|---------------|-------------|------------|
| 3.50 . . . | 1.19 . . . | 0.24 . . . | 0.35 . . . |

or equal to sulph. quinine, 4.67 per cent.

(From Mr. McIvor's Letters.)

"Ootacamund, Dec. 10th, 1873.

"This bark is taken from a hairy leaved variety of *C. officinalis*. It is a tree of wonderful growth. It produces enormously thick bark, and the tree is not injured by wind. The tree from which I now send you the bark is only five years old. It is 26 feet high and has a stem of 16 inches circumference at the ground, and the bark now sent you is taken in a strip from the stem to the height of about 13 feet from the ground.

"This tree grows at least twice as fast as the *C. succirubra*. The bark of this variety which I sent to Dr. de Vrij was taken from a tree grown at a high elevation, and from a N.W. exposure. The bark now sent you is taken from a tree growing at a low elevation with a N.E. exposure. Dr. de Vrij found the bark of this species to yield 10.67 of total alkaloids, with 4.72 of crystallized sulphate of quinine.

"If under all conditions this bark be found to yield this amount of alkaloids, and especially quinine, it is certainly the best plant we can grow, being hardy and of rapid growth, and perfectly free from canker and other diseases to which the *officinalis* and especially the *calisaya* are liable. I therefore sincerely hope that you will be able to confirm Dr. de Vrij's results, and if this occurs in the two barks taken from different positions and elevations, it will establish the value of the species beyond doubt. As the matter at present stands, the extraordinary vigorous habit of growth and hairy leaves, leave on my mind the impression that it is a species of rather doubtful quinine-producing qualities. I shall therefore be very glad if you are able to confirm Dr. de Vrij's results."

My analysis was as follows:—

| | |
|-------------------------------|----------------|
| Sulph. Quinine | 6.00 per cent. |
| Sulph. Cinchonidine | 5.00 " |
| Cinchonine | 0.60 " |
| Amorphous Alkaloid | 0.60 " |

12.20

Thus rather beyond Dr. de Vrij's results.

" Ootacamund, April 30th, 1874.

" Allow me to thank you very much for your letter of the 20th February last, and your kindness in having made the analysis of my hairy leaved variety of *C. officinalis*. This plant is, I believe, a true *officinalis*, but as it had the aspect of a bad quinine-producing species, I received with some doubt the several previous analyses I got of this variety, and therefore troubled you to examine its bark. I am now quite confident that this will be one of the most profitable varieties we can grow on the Nilghiris, and our cultivators here will, therefore, be much indebted to you for the information your letter contains.

" There are two strong growing varieties very much alike, the one having a very smooth leaf, the other (your *pubescens*) a hairy leaf. The two plants, a few yards off, look quite identical. They are so in habit and vigorous growth, and it was two years ago [therefore in 1872] that my attention was attracted by the hairy leaved variety, on all occasions on which I tested or got it tested, yielding a much larger amount of quinine and total alkaloid than the other.

" No doubt the specimens sent you, and to which you refer, were of the smooth leaf growing variety. It is to be regretted that your *pubescens* (which I think is very well named) produces so much cinchonidine; but as this alkaloid is rising in the market and in public esteem, in a few years this objection may diminish, but 5-50 of quinine is, I conclude, a bark that will always command the attention of manufacturers.

" Although *C. pubescens* is a mere variety, still, it comes true from seed, and I have not noticed any seedling of the hairy variety produce the smooth leaved variety, so closely allied to it, or *vice versa*."

" Ootacamund, June 27th, 1874.

" I had great pleasure to receive your letter of the 29th ult., and will have much pleasure in sending you dried specimens of the *C. pubescens*, and the kindred smooth leaved variety, as soon as I am able to get them. At present the plants are out of flower, and we are in the middle of our rains and enveloped in mists. The *pubescens* is, I think, intermediate between *C. succirubra* and *C. officinalis*, but partakes more of the *officinalis* type. It is a much more robust growth than either, and in all situations far outtops the *succirubra*. I send you a few seeds which, I have no doubt, you will find come up quite true, as it does not vary very much when raised from seed,

when the plants from which the seeds are collected are kept separate from other kinds.

"I take the liberty of again sending you some bark of *C. pubescens*. The bark is the narrow strip left on the same tree from which I took the bark sent to you in December last. If not giving you too much trouble, I would very much like to know what this bark yields; the more as Mr. Broughton and Dr. Biddie have been trying to impress on the Government here, that mossing does not improve the bark on the trees generally, but that the renewing bark drains the alkaloids from the natural bark adjoining, i.e., that the alkaloids in the natural bark are transferred to the renewing bark.

"I do not believe this to be the case; but if it is so in any degree, the bark now sent you will show exactly to what extent this takes place, as the narrow strips of bark were surrounded on all sides by renewing bark. I send a small specimen of the renewed bark, also taken from the same species as the bark sent you."

[The strips, like the original bark, presented the appearance of thick fine bark, and gave even a better result than those gathered seven months before, thus completely dispelling the transference hypothesis.]

The analysis was as follows:—

| | |
|-------------------------------|------|
| Sulphate of Quinine | 6.94 |
| „ Cinchonidine | 4.48 |
| „ Cinchonine | 0.20 |
| „ Quinidine | 0.14 |
| Amorphous Alkaloid | 1.14 |

12.90

Mr. McIvor continues:—

"This theory of the transference of alkaloids has been got up, I believe, to impress on our Government the disadvantage of mossing, but even if the alkaloids are transferred we would not lose anything. But the transference of any material once deposited in one part of a vegetable tissue to that of another part is unknown. A notable example of this is found in the graft. Here two plants differing in their nature are placed in the closest combination, yet in the experience of upwards of two thousand years, and with almost every species of plant, the stock has not been found to communicate to the graft, or the graft to the stock, in the minutest degree, any of those subtle influences on which depend the size and flavour of a fruit, or the colour of a flower, both the stock and graft retaining through their existence their respective qualities; though

the stock is built up by the sap elaborated by the leaves of the graft, and the graft supplied with its nourishment through the roots of the stock. Moreover, if the alkaloids are transferred, they are not transferred in the same conditions, especially so in red barks, as we find renewed red bark very rich in quinine, and this on trees where the natural bark contains scarcely any quinine."

"Ootacamund, August 16th, 1875.

"Of *C. pubescens* we planted on private plantations 20 acres last year, and this year we planted out 60 acres of this plant on the Kartary estate.

"I have another seedling raised with the same batch of hybrids, which promises to be better than *C. pubescens*, at least so far as I have been able to ascertain, it yields nearly 10 per cent. of sulphate of quinine; but I shall send specimens of this variety and of the bark also. We have only a few plants of this kind, and I overlooked it in my investigations of last year. It is not unlike No. 3 of De Vrij's analysis, but has a more oblong leaf."

I did not receive the above-mentioned specimens, and consequently am without the means of identifying the three sorts mentioned above.

The tree which Mr. McIvor sent me proved to be quite different in the bark, and I judge of no value. Some mistake had occurred and this threw me off the scent and led me to give credence to the theory of hybridization which is easily called in (like some other theories) to satisfy minds that do not desire the labour of really fathoming difficult questions.

It will be seen by what follows that the theory of hybridization must be set aside, in this case at least.

I do not find any further reference in letters from Mr. McIvor except in one received after his return from Ceylon, which journey led to his lamented decease. In this letter he speaks of its coming true from seed.

(From Colonel Beddome.)

"The Nilghiris, June 24th, 1881.

"We have a very valuable species here in what Howard calls *officinalis*, var. *pubescens*. There are two varieties, one quite glabrous on the under surface of the leaf, known here as *magnifolia*, and the other very downy, called *pubescens*. They were both supposed to be hybrids of Nilghiri origin; but they are no hybrids. I find them in our oldest plantations. Cross says he recognises the

glabrous one as the '*Pata de Gallinazo*' of the bark collectors on the Chimborazo, and that he found it at a much higher elevation than *succirubra*, and it grows here at a much higher elevation than *succirubra*, growing splendidly at over 7,000 feet, where *succirubra* will not grow at all.

"Two bales of this sold last month in England at a higher price than any *officinalis*. It was the best we have sent home. There is another distinct species that I cannot name. It has its leaves very hairy on both surfaces, like *Pahudiana*, but the flowers differ from that species, and it has an extraordinary bark, very rough and corky. There are only five trees of it in our 1865 plantations. Cross says it is the true *crispa* of the Loxa neighbourhood,* and that he only has ever collected it, and that he sent the seed of it here with *officinalis* seed in 1863, but that Melvor said it had never germinated. There are two trees here known as *officinalis*, var. *crispa*. One is a very narrow-leaved form, which is easily recognised, but not, I think, of any worth. The other is said to be known in Ceylon as "*crispa*," and is only a smaller-leaved form of ordinary *officinalis*, and quite runs into the type.

"I think on the Nilghiris at elevations above 5,000 feet, every species and variety should give way to the Uritusinga var. of *officinalis*, and to the species and varieties we call *magnifolia* and *pubescens*. They are both of splendid growth, and both have a very high percentage of quinine. The Calisayas all die out here, and so do the Grey Barks. They certainly require a lower elevation, but even in a warmer climate our long drought may be too trying for them."

WHICH KINDS OF CINCHONA BARK SHOULD BE USED IN PHARMACY?

By E. M. HOLMES, F.L.S.

The cinchona barks cultivated in Java, India, Ceylon, and Jamaica, etc., have formed for some years a regular article of commerce, and are now generally acknowledged to be superior in quality to those imported from South America.

These barks are not recognised by the pharmacopœias, and they cannot therefore be legally used in pharmacy. This is the more to be regretted because it is well known, at least to all who are conversant with the cinchona trade, that the South American barks

* Rather the *Crespillia ahumada*, which should be Pavon's *C. decurrentifolia*.
—J. E. H.

obtainable in retail commerce at the present time, although closely agreeing in appearance, and even in some external characters, with the descriptions given of the official barks, are often comparatively worthless.

Pharmacists are consequently placed in the undesirable predicament of being compelled by law to use inferior bark when better is obtainable. It therefore appears to be a suitable subject to bring before the Pharmaceutical Conference in order to obtain from representative pharmacists as well as from experts in bark analysis, a consensus of opinion and an amount of practical information which should have some weight in leading the framers of future pharmacopœias to remove this anomaly.

The points on which I venture to express an opinion, and on which it appears to me that discussion is necessary, are as follows:—

1. Is it desirable that cultivated cinchona barks should replace the uncultivated barks in medicine and pharmacy?
2. What variety can most advantageously be used?
3. The advantages of uniformity of strength of preparations of cinchona.

With regard to these points I have the following remarks to offer for consideration.

It is evident from recent papers in journals devoted to pharmacy in this country, the Continent, and the United States, that it is practically impossible to obtain in retail commerce at the present time, with regularity and certainty, cinchona bark of uniform quality, for the following reasons:—

(a) The South American cinchona and allied trees are not wholly known to Europeans, and many worthless kinds exist, which bear so strong a resemblance to official barks as to mislead the purchaser, and possibly even the collector. These inferior barks are known to be mixed, either intentionally or otherwise, with the better kinds, so that it has become necessary to analyse all the South American barks that come into the market.

(b) The demand for good cinchona bark, *i.e.*, such as will yield a large percentage of quinine, easily separable in the crystalline state, is so great that the whole of the available material practically passes into the hands of the quinine manufacturers, while the inferior or “druggists’” barks find their way into the hands of the retail purchaser.

(c) The wholesale dealer is often compelled by the requirements of his customers to purchase barks of fine appearance and moderate

price, rather than of superior quality. On the other hand, the cultivated cinchona barks are not mixed with false barks, but there is at present, and probably will be for some years, difficulty in obtaining good qualities of yellow and pale barks, the supply of these not being as yet equal to the demand for them for the purpose of making quinine, while several hybrid species, yielding inferior bark, are not unfrequently sold with those of good quality, and cannot be distinguished by external characters, except by experts. But one variety of cultivated bark, *Cinchona succirubra*, is easily obtainable in almost unlimited quantity, and of very good quality. This is due to the following facts. The tree grows at a lower elevation, and, being hardy and easily propagated, is cultivated over a much wider area than the others, and is consequently met with in larger quantities in commerce. Owing to the comparatively large amount of red colouring matter it contains, it is less sought after by quinine makers, and the supply of bark is therefore likely to increase instead of decrease.

It would appear, therefore, desirable that the cultivated cinchona barks should replace those of South America for the following reasons, viz.—

The larger average yield of alkaloids.

Their freedom from false barks.

The increasing supply which tends to render it easy to obtain bark of good quality.

With respect to the variety of cinchona bark which can be most advantageously used in medicine and pharmacy, that of cultivated *C. succirubra* seems to be the most suitable, as already suggested by Professor Flückiger, since it can be procured of good quality, contains all the cinchona alkaloids (except aricine), is less liable to be mixed with hybrids, and is more easily distinguished by its external characters than any other species.

It may further be suggested that as every cinchona bark which comes into the market is analysed before being sold, it would be an additional guarantee if the retail purchaser could be furnished by the wholesale druggist with a statement of the percentage of alkaloids on the label of the packages he purchases. Pharmacopœial preparations made from the renewed bark of *C. succirubra*, thus guaranteed as to the percentage of quinine it contains, would probably give most satisfaction to the medical profession.

Lastly, with respect to the strength of Pharmacopœia preparations of cinchona. If the red bark were accepted in future pharmacopœias, the fluid extract, if made according to the British

Pharmacopœia, would, in all probability, deposit some of its active constituents, and it might be desirable to ascertain from the experience of those present whether this is the case with the fluid extract made according to the United States Pharmacopœia, which is only one-fourth of the strength, and of which one part represents one of the bark. With respect to the decoction, it is well known that the process of the British Pharmacopœia may be repeated two or three times with the same bark, and that it will not then be exhausted. The Norwegian formula for acid decoction in which sulphuric acid is added may exhaust the bark more completely, but would not be admissible where it was desired to give ammonia with the decoction. Neither the decoction nor the infusion of cinchona possesses any advantage over the fluid extract, as the bark does not contain any volatile oil or aromatic property likely to be driven off by evaporation, and it would be a boon both to the patient and the dispenser if these preparations could be replaced in medical practice by such active preparations as the tincture or fluid extract.

The simple tincture of cinchona in the British, United States, French, and German Pharmacopœias is in the proportion of 1 to 5, and the compound tincture 1 to 10 in the British, and 1 in 8·6 in the German, and 1 to 12·5 in the United States Pharmacopœias. An approach to uniformity in strength of these preparations, therefore, depends in some measure upon the framers of the forthcoming United States Pharmacopœia. The introduction of the metric system into pharmacy is apparently only a matter of time, and it is a subject for congratulation, therefore, that the constituents of some of these preparations, except in the compound tincture of continental pharmacopœias, bear decimal relations to each other. The present meeting offers an opportunity for suggestions being made as to whether a greater uniformity of constituents in the compound tincture is either possible or advantageous. The British formula contains saffron and cochineal, and the German and five others cinnamon and gentian, but these ingredients are not contained in the British and United States formulæ.

CINCHONA BARK FOR THE PHARMACOPŒIA.

By W. DE NEUFVILLE.

In a paper published by Professor Flückiger (*Pharmaceutische Zeitung*, see also *Pharmaceutical Journal*, April 30, 1881, p. 903), he has made several statements with regard to the superiority of

East Indian cinchona bark over that of South America for pharmaceutical purposes, and he proposes the substitution of East Indian bark for the calisaya bark, which has been hitherto recognised as official bark.

Whilst appreciating the ability with which Professor Flückiger has treated the subject, I on the other hand cannot but think that much can be said in favour of still maintaining the use of South American for official purposes.

The first statement of Professor Flückiger, that flat calisaya (or the yellow bark of the British Pharmacopœia) is more scantily and less regularly imported than formerly is scarcely in accordance with fact, for the supplies of flat bark have so considerably increased during late years that the drug trade has not been found capable of absorbing them. Professor Flückiger also points out that in consequence of the geographical position and the political situation of Peru and Bolivia, calisaya bark could neither be had uniform nor in sufficient quantity. But just in these two respects calisaya offers advantages compared with most other sorts. For instance, calisaya is shipped pretty regularly during the whole year, and I do not remember any time during the past five years that the supply of calisaya bark in the European markets has not been ample for the demand. Notwithstanding the political difficulties to which Professor Flückiger refers, the shipments of calisaya have pretty regularly taken place during the late Peruvian war, and the northern districts of South America which Professor Flückiger regards as being more favourably situated in this respect are, on the contrary, subjected to much greater irregularities, and at times have altogether failed in their supply, owing to the revolutions, and, more important still, to the fact of the frequent drought of the Magdalena and other rivers.

Replying to the statement that it is not likely that the planting and cultivation of cinchonas will be undertaken in Bolivia and Peru, I can only say that the cultivation of cinchonas has already been commenced in those countries, and the trials which have been made have so far furnished satisfactory results that already for the past two years the produce of these plantations has been sold for high prices in the London market, thus proving the good quality of the bark.

It cannot be denied that of late the importations of flat bark have not at all been rich in quinine, but Professor Flückiger attaches less importance to the contents of quinine so long as there exists a sufficient percentage of other alkaloids, and of these flat

barks on an average contained over 2 per cent., as per the analyses made of the last arrivals of flat bark. It is true that most Indian barks are richer in the amount of total alkaloids, but here the question arises, are the druggists capable of extracting the alkaloids out of the Indian bark? and I am inclined to doubt it. It is a known fact that the Indian barks at first offered great difficulties to the manufacturers of quinine, and even at this date there are manufacturers who for this reason will not work Indian bark. As a druggist's bark, this objection applies more forcibly. On the other hand no bark works easier and better than the American calisaya, and this fact ought to bear weight to prevent its abandonment as an article of the official materia medica. It is not, however, to be forgotten that India sends us a great many barks very inferior in quality, and it is a very difficult matter for the druggist to discriminate between the poor and rich kinds of bark. Druggists, indeed, are very apt to favour a "showy" bark, which in fact may be very poor in alkaloids. This remark applies very forcibly when Indian barks are concerned. On the other hand, the quality of calisaya bark, more especially flat bark, is easily judged from external appearance. In addition to this, druggists have been perfectly acquainted with the character of this kind of bark for many years past.

If, after all, the *flat* American calisaya is to be abandoned on account of its not being sufficiently rich, why not adopt the American calisaya *quill*?

Calisaya *quill* has the advantage over all kinds of Indian barks of being much easier to extract, offering greater facilities for distinguishing the quality, arriving regularly during the whole year, and being better known to the druggist than any other barks, and is to be had in all grades, from 2 per cent. up to 6 per cent. of crystallized quinine sulphate, besides a good proportion of the other alkaloids.

As to the non-applicability of bark from the districts of Columbia for druggists' purposes, I am quite one with Professor Flückiger, and with the opinion that has been expounded by others competent to treat on the subject, so that nothing remains to be said by me on this point.

Votes of thanks having been passed to the respective authors of these papers,

Mr. WELLCOME said that it had been clearly shown that the percentages of alkaloid in *Cinchona succirubra* would differ very

greatly according to the conditions under which it was grown. This was also true of other valuable varieties of the cinchonas, for when grown at low altitudes, or under other unfavourable conditions, the percentage of quinia was smaller, and the proportion of lower alkaloids was likewise liable to variation. He did not think any one variety of bark could be justly adopted as an official standard. The quills which had been referred to last should certainly not, because there was no one variety which was more frequently intermixed with inferior grades, which were very difficult to distinguish except by assay. It would seem that the best official standard that could be adopted would be any bark yielding upon assay a certain fixed percentage of total alkaloids, of which a certain fixed percentage should be quinia. The value of the lower alkaloids—particularly cinchonidia—had been more fully appreciated in India and America than in England. In reference to the new bark, *Cinchona cuprea*, mentioned at the Conference last year, some light had been thrown upon it by the reports of Dr. Robbins, of New York, who had recently returned from a visit to the Columbian Forests. This *Cinchona cuprea* seems to be an exception to the general rule, not only in its appearance and structure, but also in the fact that although it is grown at low altitudes, it is a valuable quinia bark, yielding about 2 per cent. of quinia. It is reported that this bark yields little or none of the lower alkaloids. With reference to the fluid extract of cinchona of the United States Pharmacopœia, he might say that in the experience of American pharmacists it had proved very unsatisfactory. It precipitated very freely, and was not generally in favour—the compound tincture being the preparation more generally used. With regard to the process suggested by Dr. de Vrij last year, he did not know how far it had been successful, but it would be interesting to have some information upon the subject from those who had given it a practical test.

Mr. BRADY called attention to the dried specimens which Mr. Howard had sent to illustrate his paper, and invited those interested to examine them.

Dr. PAUL said there could be no doubt that at the present time there was a need for alteration in the selection of bark used for pharmaceutical purposes. He gathered from the papers which had been read, that there was some little difference of opinion as to the direction in which that change should be made. The official yellow bark and the flat calisaya bark were almost invariably worthless, so far as the presence of quinine was an element of

L L

value. The flat calisaya bark of commerce now really contained nothing more than a little cinchonine— $1\frac{1}{2}$ to 2 or 3 per cent., and was not at all equal to the character given in the Pharmacopœia, and it required to be replaced. Dr. de Vrij and Professor Flückiger were very enthusiastic in recommending a total substitution of the Indian barks for the South American, but that was a step of a somewhat extreme character. There were many reasons for approving of the introduction of Indian grown bark, both crown bark and succirubra. They were now very largely imported, and the amount of total alkaloids in them would range from 5 to 10 per cent. In the better kinds of crown barks there was a very large amount of quinine, while in the succirubra the cinchonidine preponderated. They were already finding a large application on the Continent for pharmaceutical purposes, and the greater quantity of Indian bark used pharmaceutically was sent from India. At the same time, as Mr. de Neufville had pointed out, two new kinds of bark came to this country from Bolivia and the northern parts of South America, which were very excellent barks for pharmaceutical uses. They were mostly of the character of quill calisaya, yielding $2\frac{1}{2}$ to 4 per cent. of sulphate of quinine. There was an abundant supply of them, and there was no reason why they should not be adopted. He thought the most desirable course to take would be not to exclude the South American bark, but to alter the kind of bark to be used as an officinal bark, and to supplement that with certain kinds of Indian grown bark.

Mr. GROVES said there seemed a tendency, in some quarters, to value Peruvian bark almost exclusively according to the proportion of alkaloids it contained. This doubtless was reasonable on the part of the manufacturer, but the medical man had often other objects in administering bark than giving the mere alkaloids. These could be obtained in a state of purity from very inferior sources, but the cinchotannic acid and bitter extractives were only yielded in quantity by certain barks of good quality. He therefore thought it desirable to adopt for the natural preparations (liquid extract, tincture, decoction, infusion) of cinchona, a bark such as the Indian succirubra, recommended by Mr. Holmes, which abounded in these non-alkaloidal principles and which might, according to the desire of the prescriber, be reinforced by the addition of one or more of the cinchona alkaloids derived from ordinary commercial sources.

Dr. PAUL did not wish to be understood as suggesting that the value of bark should be judged by the relative amount of alkaloid,

but there could be no comparison between flat calisaya, which contained no alkaloid at all but cinchonine, and none of these extractive principles, and another bark which would contain both.

Mr. CLEAVER remarked that Mr. Howard in his paper invited discussion on the therapeutical value of different kinds of bark; but that seemed a difficult subject, and one they could not go into without medical evidence.

The PRESIDENT said it was not their business.

Mr. CLEAVER said with regard to the employment of these barks in pharmacy, the great discrepancy showed that pharmacists ought to require that each bark should be sold with a guarantee. If they would pay a decent price, he had no doubt that they would find wholesale druggists who would supply them with bark containing a fair proportion of alkaloidal matter. Most of the wholesale druggists either had analyses of the barks they bought, or could get them, and would be very pleased to supply intending customers with analyses of the barks they wanted.

The following paper was then read—

NOTE ON THE CRYSTALLIZATION OF ORTHO- PHOSPHORIC ACID.

By H. P. COOPER, F.C.S.

Specimens of orthophosphoric acid in crystals have been recently shown at various exhibitions, and have attracted considerable notice.

The preparation of the acid in this form can scarcely be regarded as a novelty. It has been long known to chemists that the acids of phosphorus are crystallizable, and the melting points, heat of fusion, etc., of the crystals have been carefully studied by Thomsen and others. Down to the present time, however, no attempt appears to have been made to produce the crystallized acid commercially, a fact which may probably be accounted for by the existence of a certain degree of doubt as to the conditions necessary to ensure the formation of crystals of ortho-acid, uncontaminated with other varieties.

It was with a view of clearing up this latter point that my experiments, the results of which are here noted, were commenced.

My starting point was a solution of pure orthophosphoric acid, of specific gravity 1.750. This represents the most concentrated acid met with in commerce, and as is well known does not under any condition show a tendency to crystallize.

An acid of this strength contains 92· per cent. H_3PO_4 .

Successive portions of the acid were evaporated at a gentle heat in a platinum dish, and thus a series of liquids of various degrees of concentration were obtained. In each case the specific gravity was carefully noted, and the solutions, after being tested for metaphosphoric acid with negative results, were set aside in closely stoppered vials. The experiments were continued until at length an acid was obtained of specific gravity 1·875, which after standing for about twelve hours gelatinized; pyrophosphoric and metaphosphoric acids were here found to be present in abundance, and it was evident the concentration had been carried too far.

The solutions of lower gravity were then watched, in the hope that crystals would make their appearance, but at the end of a fortnight they remained unchanged.

When almost despairing of obtaining the crystallized acid in this way, it occurred to me that possibly crystallization might be induced by introducing into the concentrated liquid a fragment of some solid body. Into one of the bottles, therefore, which contained acid of specific gravity 1·850, I dropped a crystal of sodium sulphate, and in the course of a few hours I was gratified to observe splendid tufts of prismatic crystals forming in the solution, which rapidly grew until the contents of the bottle were transformed into an almost solid mass, heat being evolved at the same time.*

A portion of the crystals, carefully freed from adhering mother liquor, was then submitted to analysis, with the following results:—

·271 grm. crystals gave ·306 $\text{Mg P}_2\text{O}_7$, equals 100·04 per cent. H_3PO_4 .

·547 grm. crystals gave ·621 $\text{Mg P}_2\text{O}_7$, equals 100·10 per cent. H_3PO_4 .

·318 grm. crystals gave ·360 $\text{Mg P}_2\text{O}_7$, equals 99·9 per cent. H_3PO_4 .

A portion of the mother liquor yielded the following results:—

·875 grm. liquor gave ·980 $\text{Mg P}_2\text{O}_7$, equals 98·88 per cent. H_3PO_4 .

·528 grm. liquor gave ·590 $\text{Mg P}_2\text{O}_7$, equals 98·82 per cent. H_3PO_4 .

The smallest fragment of the crystallized acid will induce crystallization in a large bulk of liquid acid of specific gravity 1·850; the formation of the crystals being strikingly beautiful.

This form of orthophosphoric acid is an exceedingly deliquescent

* Hydrrous salts do not act so well as anhydrous ones, since the phosphoric acid absorbs the water of crystallization, thus interfering with their action.

compound. If a few crystals are left exposed to the atmosphere, they liquefy in a very short time.

I have not been able to induce crystallization in an acid of a lower specific gravity than 1.800, nor have I succeeded in obtaining a concentrated acid, of a gravity between 1.850 to 1.875, which will crystallize spontaneously, even on continued agitation of the liquid.

When the concentration is allowed to proceed to the latter point, pyrophosphoric and metaphosphoric acids, as I have pointed out, are invariably produced.

My thanks are due to Messrs. Fletcher, Fletcher & Stevenson, for allowing me to work out these experiments in their laboratory.

A vote of thanks was passed to Mr. Cooper.

The last paper read was entitled—

INVESTIGATIONS ON SUCCUS GLYCYRRHIZÆ,
PARTICULARLY AS REGARDS THE AMOUNT
OF GUM CONTAINED.

By H. P. MADSEN,

Vice-President of the Danish Society of Apothecaries.

Although succus glycyrrhizæ is one of the oldest medical preparations, being mentioned as early as in the fourth century, and at the same time one of the most frequently employed, there are nevertheless but comparatively few investigations to be found on the subject. As regards the manufacture of succ. glycyrr., the employment of steam has occasioned a change in its preparation. The pure succ. glycyrr. (liquorice root extracted by maceration with water, inspissated and rolled out in cylindrical sticks) does not keep well, whereas, on the contrary, when steam is employed solid substances are extracted, which makes it possible to produce a liquorice that can eventually become hard and perfectly solid.* The inventor of this method is M. Delondre, and he has come to this result in repeatedly submitting liquorice root, reduced into coarse powder, to the direct influence of steam; the liquids resulting from this process are clarified by gelatine and evaporated to the consistence of an extract. The extract rolled out in sticks is exposed during ten days in ovens at 35°. In the more recently established manufactories the processes are generally performed by steam power, but there is, however, a great deal of liquorice to be found in commerce, which, although having the best and most

* "Pharmacographia," Hanbury and Flückiger, London. 1874. P. 160.

esteemed marks, is nevertheless adulterated both as regards its composition and its trade-mark. Chevallier* distinguishes between the Italian, the Spanish, and the French succ. glycyrr., but of late years large manufactories have also been established in Greece and Asia Minor. He adds also, that there exists besides these another group of succ. glycyrr. prepared by fabricants (*les refondeurs*) who purchase it from the large manufactories in order to dissolve and mix it with different farinaceous substances or ordinary gums,† and occasionally perhaps with the juice of different fruits, as plums, carob beans, chestnuts, etc. The adulteration with meal‡ may be easily detected, since the greater amount remains on being treated with cold water, whereas the adulteration with substances soluble in cold water are more difficult to detect, and gum is one of the latter. The following case was the cause of these investigations. In the Danish Pharmacopœia there are two preparations, viz., liquor pectoralis and tinctura opii benzoica §, which, when mixed together in equal portions, is a pectoral remedy much employed and much used by physicians. The mixture is not clear, but quickly deposits a sediment, and can || then be easily filtered clear. At the commencement of this winter it happened that I could not get such a mixture to turn as clear as usually. It precipitated white streaks on the glass in which it was being mixed, which, however, immediately afterwards disappeared; while on the other hand my efforts to filter the mixture clear were unsuccessful. The white streaks at once directed my attention to gum, but the interesting conclusions I arrived at, whilst making the investigation, induced me to extend it to several other kinds of liquorice, as well as to a closer study of the drug. I was the more stimulated to do so from a conversation I held by chance with the representative of one of the larger French liquorice manufactories, who stated that it was

* "Dictionnaire des Altérations et Falsifications." A. Chevallier et Baudrimont. Paris, 1878. P. 1057.

† See Appendix.

‡ Treatment with iodine is not sufficient, because amyllum is found in liquorice root.

§ The composition of liquor pectoralis is:—*Extractum glycyrrhizæ pars una solvatur in aqua fœniculi part. iii., solutio seponatur et probe conquassetur cum spir. ammoniac. anisati parte una.* The composition of tinct. opii benz. is:—

| | | |
|------------------|-----------|-----------|
| Ætheroleum anisi | | 8 partes. |
| Camphora | | 4 " |
| Acid. benzoicum | | 6 " |
| Opium pulv. | | 6 " |
| Spiritus dilutus | | 1200 " |

|| The mixture is not filtered before it is dispensed, because the sediment contains morphia.

his opinion, that gum as a rule is added to liquorice juice, when the latter is to be made up into cylindrical sticks, in order to make it durable and improve its appearance.

Mr. Schleisner, Cand. Pharm., rendered me his assistance in carrying out the investigation, and Mr. Rützan, Cand. Pharm., made the microscopic drawings. I have much pleasure in tendering these gentlemen my best thanks.

The different samples of succ. glycyrr., which were experimented upon, were bought at different places and all bore the mark "Baracco;" they were all of them of the usual cylindrical stick form, with the exception of *A**, which is in pieces of the shape of a brick, weighing 5 kilograms each, and *H*, which is an extraction of liquorice root with cold water in the ordinary extract form, that my colleague, Assessor Pharmacæ Piper, has been so kind as to let me have, as he had just prepared some of it.

Physical Description.

A. Brick-formed pieces, very tough, shiny on the surface.

B. Friable, shiny.

C. Friable, shiny.

D. Friable, shiny.

E. Friable, shiny.

F. Friable, shiny.

G. Very tough, shiny.

H. Ordinary extract form.

First Experiment.—10 grams of each sort were weighed and dried for 15 hours at 100° C.

Result.

| | Before dried. | After dried. | Evaporated Water. | Percentage of Water. |
|-----------------|---------------|--------------|-------------------|----------------------|
| <i>A.</i> . . . | 10 grams | 8.350 | 1.650 | 16.50 |
| <i>B.</i> . . . | 10 " | 8.500 | 1.500 | 15.00 |
| <i>C.</i> . . . | 10 " | 8.740 | 1.260 | 12.60 |
| <i>D.</i> . . . | 10 " | 8.565 | 1.435 | 14.35 |
| <i>E.</i> . . . | 10 " | 8.50 | 1.450 | 14.50 |
| <i>F.</i> . . . | 10 " | 8.835 | 1.145 | 11.45 |
| <i>G.</i> . . . | 10 " | 8.95 | 1.050 | 10.50 |
| <i>H.</i> . . . | 10 " | 6.844 | 3.156 | 31.56 |

* I received the latter from MM. Abauzit Perdrix and Aubressy, Uzès, France, whose manufactory is at Mequinenza, Spain. "Pharmacographia," page 161, says, that liquorice paste is largely imported from Spain and Asia Minor, but on account of a certain bitterness is unsuited for use as a sweet-meat; what I have received has as sweet and agreeable a taste as the finest liquorice.

Second Experiment.—Determination of Ash.

A certain part of each liquorice sample was weighed and calcinated.

Result:—

| | Weight of substance. | Ash. | Percent. |
|------------|----------------------|-------|----------|
| A. | 1.321 | 0.164 | 12.41 |
| B. | 1.116 | 0.102 | 9.13 |
| C. | 1.166 | 0.073 | 6.26 |
| D. | 1.106 | 0.073 | 6.60 |
| E. | 1.566 | 0.095 | 6.06 |
| F. | 1.131 | 0.161 | 14.23 |
| G. | 1.261 | 0.080 | 6.34 |
| H. | 1.980 | 0.144 | 7.27 |

Third Experiment.—Maceration in Cold Water.

Ten grams of each sample were macerated at an ordinary temperature in 100 grams of water during twelve hours, and then filtered, and the undissolved residue washed with 200 grams of water, so that succ. glycyrrh. was extracted by water in the proportion of 1 : 30.

The liquorice was cut in small pieces, which showed, on being dissolved, the following peculiarities:—

A. Very tough and sticky; cling fast to the side of the glass; give a turbid solution.

B. The pieces remain in the original form on the bottom of the glass (do not fall away), become nearly colourless and a clear black liquid covers them.

C. Do not stick to the glass; go into powder in the water. Very turbid solution.

D. Same state as in C.

E. The pieces remain very tough and sticky, and although not so tough as those in A, must nevertheless be shaken a good deal before they dissolve.

F. Same as in C and D.

G. Tough and sticky.

H. Are clearly dissolved in water. The solutions B, C, D and H are comparatively quickly filtered; A, E, F and G, on the contrary, very slowly.

The insoluble residue was dried at 100° C. and thereupon weighed.

The Insoluble Residue dried at 100° C.

| | Of ten grams Succus Glycyrrh. | Percentage. |
|------------|----------------------------------|-------------|
| A. | 1·795 | 17·95 |
| B. | 2·540 | 25·40 |
| C. | 2·515 | 25·15 |
| D. | 2·110 | 21·10 |
| E. | 3·450 | 34·50 |
| F. | 2·695 | 26·95 |
| G. | 3·750 | 37·50 |
| H. | traces | |

By adding the amount of moisture contained and the insoluble residue together, and subtracting the quotient from the employed weight of succ. glycyrrh., one gets the figure of the amount of true extract that is contained in it in a dry state. This is shown in the following table.

| | Water. | Dry Insoluble Residue. | Total. | Dry Extract. |
|------------|--------|---------------------------|--------|--------------|
| A. | 16·50 | 17·95 | 34·45 | 65·55 |
| B. | 15·00 | 25·40 | 40·40 | 59·60 |
| C. | 12·60 | 25·15 | 37·75 | 62·25 |
| D. | 14·35 | 21·10 | 35·45 | 64·55 |
| E. | 14·50 | 34·50 | 49·00 | 51·00 |
| F. | 11·45 | 26·95 | 38·40 | 61·60 |
| G. | 10·50 | 37·50 | 48·00 | 52·00 |
| H. | 31·56 | traces | 31·56 | 68·44 |

After the amount of water had been determined in this manner, as well as the amount of residue which was insoluble in cold water by maceration, and the real quantity of extract, I commenced the investigation of the last mentioned to try if it contained gum, and if so to ascertain the amount, to which end I first precipitated the watery extract with alcohol.

Fourth Experiment.—Behaviour of the Aqueous Extract to Alcohol.

The extracted solutions, produced as before mentioned by 10 grams of each sample treated by cold maceration with 100 grams of water and washed with 200 grams of water, were evaporated to 100 grams, and each of them was precipitated by an amount of alcohol (specific gravity, 0·830) equal to four times the volume of the liquorice juice. The precipitates were collected and washed

with alcohol until the latter ran off in a colourless state, and they were thereupon dried at 100° C. and weighed.

Precipitates when treated by Alcohol.

| | In ten grams of Succ. Glycyrrh. | Percentage of Precipitate. |
|------------|------------------------------------|-------------------------------|
| A. | 3·100 | 31·00 |
| B. | 3·310 | 33·10 |
| C. | 3·010 | 30·10 |
| D. | 2·665 | 26·65 |
| E. | 4·560 | 45·60 |
| F. | 4·300 | 43·00 |
| G. | 3·050 | 30·50 |
| H. | 1·900 | 19·00 |

The Appearance of the Precipitates produced by Alcohol, and of the Liquid which was obtained by Filtration therefrom.

| | |
|--|----------------------|
| A. large dark lumps. | dark Madeira colour. |
| B. tawney brown lumps | reddish brown. |
| C. rough granular lumps, rather larger than in B | " |
| D. fine greyish brown powder | very dark. |
| E. greyish brown lumps | reddish brown. |
| F. resembles E | " |
| G. brown lumps | " |
| H. brown lumps | dark Madeira colour. |

Fifth Experiment.—Determination of the Amount of Sugar.

The watery inspissated solution of succ. glycyrrh. was mixed with Barreswill's liquid, and the mixture placed at an ordinary temperature until the following day; an abundant precipitation of cuprous oxide took place. Estimation of sugar was carried out in all the samples.

The solution, which was employed for the purpose, was of the following composition:—

34·639 grams crystallized cupric-sulphate,
200 c.c. distilled water,
100 grams glycerine,
488 c.c. solution of soda [Na HO];

the whole diluted to 1000 c.c.

A weighed sample of each liquorice solution was boiled with the copper solution, and quickly filtered, and washed with boiling water, after which the cuprous oxide converted into cupric oxide was calcinated, the necessary precautions being regarded.

It cannot be supposed that other substances in the liquorice contributed to this reduction; by the precautions that were taken, gum does not exert any influence.

Determination of Sugar.

| | | |
|----|-------|-----------|
| A. | 14.48 | per cent. |
| B. | 15.17 | " |
| C. | 15.11 | " |
| D. | 11.09 | " |
| E. | 10.09 | " |
| F. | 10.82 | " |
| G. | 7.33 | " |
| H. | 12.84 | " |

Sixth Experiment.—Determination of the Amount of Gum present.

Ten grams of each sample were macerated with 100 grams of distilled water for twelve hours, and thereupon filtered, which required a long time, especially for the samples A, E, F, G, and washed with 200 gr. of distilled water. The solutions were reduced by evaporation to 100 grams. The alcohol-precipitates—besides any possibly contained gum—contained albuminates and a great deal of colouring matter. The question was therefore to find a method for the determination of gum in liquorice, because I have not found a method in that direction in the literature.

Preliminary experiments were made with liquorice juice to which was added gum, as well as with solutions of pure gum arab., which were precipitated with salts of lead, salts of iron, and salts of aluminium, but all with unfavourable results. A pure gum solution is precipitated by cupric sulphate and soda solution,* copper gummate being precipitated; however, it will not do to work with too diluted liquids and rather strong soda solution. When an attempt was made to apply this reaction to liquorice solution, it became apparent that either no precipitate was produced, or that the precipitate so produced immediately afterwards was resolved again in the liquid. The reason of this appearance is, that the copper gummate is soluble as well in cane as in grape sugar solution, and in the latter moreover without difficulty.

The following method was therefore employed, by which the sugar was removed before the gum was precipitated. Ten grams of succus glycyrrh. was extracted in the usual way with 300 grams of water, and the filtrate evaporated until it was reduced to 100 grams, and then completely precipitated with alcohol, sp. gr. 0.830.

* C. T. Barfoed, "De organiske Stofferne kvalitative Analyse." Kjøbenhavn. p. 194.

The precipitate was washed with alcohol until all sugar reaction had disappeared, and was then dissolved in as little water as possible, and cupric sulphate (1 + 10) and soda solution were added until perfect alkaline reaction. The precipitate was first washed with strong soda solution, and then with a diluted soda solution. The albuminates and colouring matter passed completely into the filtrate. One can generally see from the colour of the remaining copper gummate and the colour of the filtrate when the precipitate has been sufficiently washed; a careful washing with not too diluted soda solution is, however, necessary, in order to remove the albuminates and colouring matters. The precipitate was thereupon dissolved in diluted hydrochloric acid, and precipitated with alcohol. The precipitate that resulted from this clearly proved itself to be arabin by its adhesiveness and by its subsequently drying up into gum-like masses, as well as its appearance and behaviour in all other respects. Acetic acid was also tried as a solvent, and although it dissolved the copper gummate easily, and the precipitate produced, when alcohol was added, was better collected on the filter, this method had nevertheless to be relinquished since the precipitated arabin obstinately held back small quantities of copper. Experiments were tried four times over with choice, clean gum-arabic in order to demonstrate its accuracy. First the amount of water was determined, the gum being dried for six hours at 85° C., six hours at 95°, and three hours at 100°, from which resulted 14·86 per cent. of water. Then the amount of ash was determined, the result was 3·15 per cent. Four samples were then weighed out, designated respectively as *x*, *y*, *v*, and *z* :—

$$x = 0.849$$

$$y = 0.907$$

$$v = 0.844$$

$$z = 0.794$$

Thereupon each of them was dissolved apart at an ordinary temperature in distilled water, and precipitated with cupric sulphate and soda solution. The precipitate was dissolved on the filter in hydrochloric acid, precipitated with alcohol, and herewith washed until the copper and chlorine reaction had disappeared.

Amount of Arabin.

| Gum Arabic. | | Arabin. |
|------------------|-----------|---------|
| <i>x</i> = 0.849 | | 0.727 |
| <i>y</i> = 0.907 | | 0.767 |
| <i>v</i> = 0.844 | | 0.701 |
| <i>z</i> = 0.794 | | 0.657 |

If the amount of moisture and ash is calculated after the above analysis, and added to the above figures, one gets for each of the four samples, instead of 100,—

$$x = 108.40$$

$$y = 101.42$$

$$v = 100.94$$

$$z = 100.62$$

Although the method employed may appear to arrive at too high a result, it will nevertheless be sufficiently accurate for approximately determining the amount of gum present in liquorice, since the gum, moreover, is determined as arabin, and the amount of ash and water must therefore be added to it, in order to arrive at the amount of gum present, which consequently will only be approximately correct.

After the preliminary experiments had been made, and the above-mentioned information acquired, investigations were instituted into the different sorts of liquorice. 10 grams of each sort of succ. glycyrrh. were treated with 300 grams of distilled water in the above-mentioned manner, and the solution reduced by steam until 100 grams was reached. It was then precipitated with alcohol (specific gravity, 0.830) and the precipitate washed with the same liquid, until the last trace of sugar had disappeared. The coloured precipitate was dissolved in water on the filter* itself, and thereupon precipitated with cupric sulphate solution (1:9) and solution of soda. About 50 c.c. of cupric sulphate solution was required in order to induce a complete precipitation, so that the soda solution might—besides the copper gummate—precipitate an excess of hydrated cupric oxide. Solution of soda was added until a strong alkaline reaction set in. The precipitates were collected on the filters and first washed with a little distilled water in order to expel the strong sodic hydrate; then with diluted solution of soda until the latter ran colourless through. The precipitates were then dissolved upon the filter itself, in hydrochloric acid, and precipitated by alcohol, by which means the arabin was separated in white lumps.

After washing and drying, the following amount of arabin was found:—

* Interesting rotatory phenomena were noticed in the dissolution process, which resembled those that take place when minute pieces of camphor, valerianate, and butyrate of barium come in contact with the surface of pure water. Experiments with pure gum precipitated by alcohol showed the same result.

| | |
|----|----------------|
| A. | 8.82 per cent. |
| B. | 4.86 " |
| C. | 2.43 " |
| D. | 1.52 " |
| E. | 10.49 " |
| F. | 9.13 " |
| G. | 8.39 " |
| H. | 1.19 " |

Although the arabin was clearly evident by its characteristic appearance, and moreover, from its behaviour under the applied process, could scarcely be anything but arabin, the following experiments to establish its identity were nevertheless undertaken, principally with respect to *H*. The precipitate was dissolved but slowly in water, whereby a slimy, limpid liquid was obtained, which was divided in two portions. The one was precipitated with basic acetic lead solution, from which resulted a copious precipitate of gummate of lead; whilst the other portion was examined after the method of C. Reichel; i.e., boiling with orcin and hydrochloric acid, whereby a violet colour was produced.

Résumé.

| Number. | Percentage of Water contained. | The Dried, in water insoluble, Residue. | Percentage of Dry Extract contained. | Percentage of Ash. | Percentage of Sugar. | Percentage of Arabin. |
|---------|--------------------------------|---|--------------------------------------|--------------------|----------------------|-----------------------|
| A. | 16.50 | 17.95 | 65.55 | 12.41 | 14.48 | 3.32 |
| B. | 15.00 | 25.40 | 59.60 | 9.13 | 15.17 | 4.36 |
| C. | 12.60 | 25.15 | 62.25 | 6.26 | 15.11 | 2.43 |
| D. | 14.35 | 21.10 | 64.55 | 6.60 | 11.09 | 1.52 |
| E. | 14.50 | 34.50 | 51.00 | 6.06 | 10.09 | 10.49 |
| F. | 11.45 | 26.95 | 61.60 | 14.23 | 10.82 | 9.13 |
| G. | 10.50 | 37.50 | 52.00 | 6.34 | 7.83 | 8.39 |
| H. | 31.56 | traces | 68.44 | 7.27 | 12.84 | 1.19 |

If these results are compared, particularly when keeping well in view the object of this investigation—viz., the determination of the amount of gum present—then one must first of all attach importance to the fact that gum must be found in all succus glycyrrhizæ. The experiment with *H* is decisive in this direction, for there is no doubt but that it is liquorice root macerated with cold water, but this observation agrees with the fact that gum is to be found in the wood of almost every tree. The sample *D* nearly agrees with *H*, when one bears in mind that *H* contains 31.56 of water, whilst *D* only contains 14.35. As regards *A*, which is in brick-formed

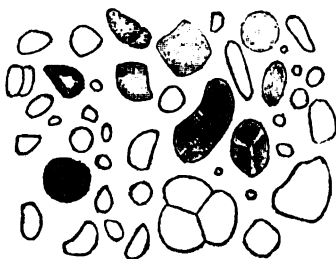
pieces, the manufacturers have assured me that there is no trace of admixture in this liquorice, and that the larger amount of gum must be due to the fact of the root being exhausted by steam.

On the whole, *A*, *B*, *C*, *D*, and *H*, show such a striking difference from *E*, *F*, and *G*, that one can without hesitation affirm that gum is intentionally added to the latter; and its admixture is doubtless made by the manufacturers with a view of giving the liquorice a fine appearance, particularly when broken in fragments—but which makes it useless from a pharmaceutical point of view.

The Microscopic Investigation.

All the samples contained remains of cells as well as of starch granules.

A, *B*, *C*, and *D* contained only deformed starch granules, which must be supposed to be the starch of the root itself; whereas *E*, *F*, and *G* also contained whole and unaltered starch granules, and *E* only potato-starch, whereas *F* had a mixture of wheat and potato starch. In *G* the starch appears to be added to the warm extract solution, by which a part is swelled up. *H* contained, besides the remains of cells and deformed starch granules, crystals of sugar.



STARCH GRANULES OF THE LIQUORICE ROOT, MAGNIFIED 900 TIMES.

The microscopic investigation proves that the liquorice samples *E*, *F*, and *G* also were adulterated with different kinds of starch, besides which gum is mixed with them.

A vote of thanks was passed to Mr. Madsen.

CLOSING BUSINESS.

PLACE OF MEETING FOR 1882.

Mr. CHIPPERFIELD said he had been deputed by the pharmacists of Southampton and the locality to invite the British Pharmaceutical Conference to that town, on the occasion of the annual meeting of the British Association next year, and he trusted that the British Pharmaceutical Conference would receive, at the hands of the said pharmacists, a hearty welcome. In order, however, to prevent the possibility of disappointment, he thought it but right to mention that one of the marked characteristics of the inviters was their poverty. He trusted and did not doubt that it was honest poverty, and therefore he was sure they would all agree with him that it did not necessarily carry with it either stigma or reproach; but when he looked around the hall and observed the benignity that seemed to radiate from almost every countenance, he was quite sure that the owners of those faces must have a firm belief in the truth of the words of the psalmist, "that he that is of a merry heart hath a continual feast"; and further, that a "dinner of herbs," under certain circumstances, was better than a "stalled ox," under certain others. He was therefore not without hope that the afore-said honest pharmacists might be able so to entertain the Conference as to give little occasion for any great amount of grumbling.

Mr. G. F. SCHACHT said there could be no doubt that this invitation, thus heartily and characteristically offered, would be accepted; but it might be possible the meeting would like some expression given of its appreciation of this cordial invitation, and therefore he begged to move that the cordial invitation of the Southampton chemists now presented be accepted with equal cordiality.

Mr. BORLAND (Kilmarnock) seconded the motion.

The motion was put and carried unanimously.

A ballot for the election of officers of the Conference for the succeeding year was then taken, Mr. Barnard Proctor (Newcastle), and Mr. Clark (Leicester) being appointed Scrutineers.

Whilst the papers were being examined,

Mr. BRADY moved—

"That the cordial thanks of the non-resident members of the British Pharmaceutical Conference be given to the local Committee, especially to Messrs. Davison, Clark, Dresser, and Sowray, for the very successful manner in which the various arrangements connected with the York meeting had been carried out."

He said that the acclamation with which these words were received saved him from a very serious duty, for if he were called upon to give in detail the reasons why they were under obligation to these gentlemen, it would be a long story; one or two points, however, he must allude to. It was not merely that their Yorkshire brethren had made arrangements for the scientific engagements of the gathering, but they had arranged so generously as to the mode in which they were to occupy their leisure that time failed to do half that had been laid out for them. They had to thank them too for their hospitality, and not only so, but for the elegant way in which it had been dispensed, thanks to certain ladies who had superintended the decorations. He was glad to see they had more ladies present than on many former occasions, and he hoped that in this particular the Conference would follow in the wake of the American Association, and let it be known that ladies were welcomed at these annual meetings. He had much pleasure in moving the vote of thanks.

Mr. EKIN, in seconding the motion, said he would not detain the meeting by adding to what Mr. Brady had said. Those who knew anything of Yorkshire quite anticipated a thoroughly cordial welcome, and they would not go away disappointed.

The resolution was carried unanimously.

Mr. DAVISON, in reply, said this was the only period during the Conference when he rose with any degree of embarrassment. He could assure the meeting that if their arrangements had met with approval the Committee had been equally pleased to receive the members of the British Pharmaceutical Conference at York. What had pleased him more than anything else was the fact that so many young men had come forward to fill the gaps which the unsparing hand of death had made in their ranks. He had the greatest faith that they would persevere in the line they had marked out for themselves, and would in the future worthily fill the places of those who had gone before. He was no advocate for elevating the trade into a profession. The young men had to gain their living by trade, and trade alone, and the rewards of science were only very sparingly dealt out to some few individuals; but, notwithstanding this, it did appear to him that it was more desirable than ever that every man who entered the trade should have some knowledge and experience of scientific investigation. The tendency of trade was to concentrate the manufacture of chemicals into few hands, and in many cases special articles were almost confined to one particular firm, who thus got a monopoly. That of itself would show the

M M

necessity of every tradesman being able, to a certain extent, to make a scientific investigation as to the purity of the articles which he was called upon to dispense. He had now been Local Superintendent of the examinations for the York centre for many years, and nothing had concerned him more than to see how many of the young men who presented themselves were quite incompetent to pass, and did not pass, the preliminary examination, and that a great many of them never came forward again. What made it more grievous was this, that it did not appear to him that it was in Latin and such branches that they failed, but in the ordinary liberal education of Englishmen—in grammar, arithmetic, and composition. Sometimes candidates came and asked him if he thought they would pass, when he always told them to go home and work out the questions again with the assistance of their books and teachers, and then they need not wait a fortnight or so to know the result, as they could easily tell by the difference between the papers they had sent in and the papers they prepared at their leisure with the assistance of their books. He feared that he personally had only been an ornamental member of the Committee, but if he had been of service it was in the influence he had exercised in bringing the members of the trade together.

Mr. DRESSER also acknowledged the vote.

Mr. CLARK said it had been matter of deep regret to him in past years that he had not been able to do anything to aid the good cause of the Pharmaceutical Conference. This year, if he had done any part of the work, he was very gratified. He remembered that at the last meeting he said there was a great deal to do at York, but their worthy President, who was by his side, remarked that he also was a Yorkshireman, and any assistance he could give to his York friends, he should be happy to render. He need not say how much of the success of that meeting was due to the advice and assistance received from him.

Mr. SOWRAY (who had just entered the room) being called upon, said he had not heard what had taken place, but for whatever had been said he begged to thank the meeting. Anything he had been able to do which had afforded satisfaction to the ladies and gentlemen now present, had been done gladly and willingly, and he hoped it had given satisfaction.

OFFICERS FOR NEXT YEAR.

Mr. BARNARD S. PROCTOR (Newcastle), on behalf of the scrutineers, reported that the following had been elected officers for 1881-82:—

President.

PROFESSOR ATTFIELD, Ph.D., F.R.S., F.I.C., F.C.S.

Vice-Presidents.

THOMAS GREENISH, F.C.S., F.R.M.S., London.

R. CHIPPERFIELD, Southampton.

J. R. YOUNG, Edinburgh.

PROFESSOR TICHBORNE, LL.D., F.I.C., F.C.S., Dublin.

Treasurer.

C. EKin, F.C.S., London.

General Secretaries.

F. BADEN BENDER, F.C.S., Manchester.

MICHAEL CARTEIGHE, F.I.C., F.C.S., London.

Other Members of Executive Committee.

ALEXANDER KINNINMONT, F.C.S., Glasgow.

J. C. C. PAYNE, Belfast.

SIDNEY PLOWMAN, F.I.C., F.C.S., London.

W. B. RANDALL, F.C.S., Southampton.

P. W. SQUIRE, London.

CHARLES SYMES, Ph.D., F.C.S., Liverpool.

G. S. TAYLOR, F.C.S., London.

J. C. THRESH, B.Sc., F.C.S., Buxton.

C. UMNEY, F.I.C., F.C.S., London.

Local Secretary.

O. R. DAWSON, Southampton.

Auditors.

R. DRESSER, York.

JAMES SPEARING, Southampton.

Professor ATTFIELD said he could only thank the members for this new mark of their confidence in him. Supported as he was sure he should be by the kind aid of his colleagues, and by the indulgence of the other members, he would endeavour to maintain the interest of the Conference with that dignity and efficiency which had characterized his predecessors.

Dr. SYMES then moved—

“That the best thanks of the Conference be given to Messrs. Terry & Son, Messrs. Backhouse & Son, and the York Glass Company, for their kindness in allowing the members to inspect their works; also to the Yorkshire Philosophical Society for granting free admission to the Museum Gardens, and to the Governor of the Castle for allowing an opportunity to visit that building.”

He need not comment on the motion, but he might say how much the liberality and kindness of such firms contributed to the intellectual enjoyment of such meetings.

Mr. WARD (Sheffield) seconded the motion, which was carried unanimously.

Professor ATTFIELD proposed—

“That the thanks of the meeting be given to the Governor, Deputy-Governor, and Wardens of the Court of the Merchants' Company for the use of the rooms.”

He could assure those gentlemen, from his past experience, when he was Secretary, that the Conference had never had a suite of rooms more perfectly adapted to its requirements.

Mr. GROVES seconded the motion, which was carried unanimously.

Alderman TERRY, in reply, assured the meeting that it was very cheering to come to hear the remarks of Professor Attfield, because his experience rendered them valuable. He felt that he had a grateful duty to discharge in promoting the arrangements for this very important gathering of the Pharmaceutical Conference, and he was sure his brethren would appreciate the compliment which had now been passed. He trusted that all who had come there would return home with pleasant remembrances of the old city of York.

Mr. GREENISH next moved—

“That the hearty thanks of the members are due and are hereby tendered to the President for the courteous and very able manner in which he has conducted the business.”

He did not think there was one gentleman present but must feel that the Conference had been a very great success,—perhaps one of the most successful. The success of a conference was very much due to the chairman, and it had been due on the present occasion to the President. The able manner in which he had conducted the whole business and taken up the threads of the discussion entitled him to their most cordial thanks.

Mr. KINNINMONT seconded the motion.

The motion was carried by acclamation.

The PRESIDENT, in reply, said the members might be sure he felt a great gratification at the undoubted success of the meeting, with regard to which he might say a word or two of a statistical kind. The attendance book showed that one hundred and sixty-eight persons had attended during the two days; they had records of the past meetings which had been referred to, from which it appeared that there had been three meetings only, namely, in London, in Liverpool, and in Glasgow, which had exceeded that figure, and the highest of those only showed eight more than the number present at York. As to the other thirteen meetings, the numbers attending them were below those of the present year, in many cases conspicuously so. He regarded the resolution as capable, by a process of analysis, of being divided into two parts, one being personal to himself. He thanked them very sincerely for the kind reception they had always given him and for their support on the present occasion. He was not so vain as to suppose that he deserved a very large part of the credit for the success of the meeting; he recollected that Sheridan, once hearing some one speak of a bad habit which the Prince Regent had of taking credit to himself for everything that had happened when he was about, remarked that undoubtedly it was so, but what His Royal Highness especially prided himself on was the present abundant harvest. He would endeavour to avoid that mistake. He was happy to think that there had been no drawback to their success, but any President who was supported by such a staff of officers,—by the Secretaries, Mr. Benger and Mr. Carteighe, the Treasurer, Mr. Ekin, and by the past Presidents, of whom he had now become one, and whom he regarded as something like the old moons, the destiny of which so puzzled the little boy,—could not fail of being successful.

THE EXCURSION.

On Thursday, by the invitation of the Local Committee, a party of one hundred and forty, including many ladies, proceeded on an excursion to Ripon and Fountains Abbey. Fortunately no rain fell throughout the day, but the weather was very cold, and the sky was obscured by clouds. At 10.30 a special train conveyed the party from York, and after stopping at Starbeck only to pick up friends from Harrogate arrived promptly at Ripon at 11.40. Among the many pleasant views on the road that of Knaresborough, picturesquely situated on the river Nidd, was perhaps the most admired. Conveyances were waiting at the station to take the visitors at once to the Cathedral. Here a most courteous guide pointed out the chief beauties and curiosities of the noble pile. After the various styles of architecture had been much admired, St. Wilfrid's Needle was visited. This is a crypt under the centre tower, entered by a long narrow passage. On one side is an opening eighteen inches by twelve which communicates with another passage, and through this were drawn in olden times damsels of doubtful chastity as a test of their fair fame. Now it is said that any maiden "threading the needle" will gain a husband before the end of another year, and a married lady would lose her husband, if a bad one, within the same time. Many ladies of the party laughingly went through the ordeal. Lunch was provided at the Unicorn at 1 p.m., and conveyances were again in readiness to convey the party to Fountains Abbey. A party of the more vigorous walked across the fields through the village of Studley and the park to the grounds. Many charming views of the country were obtained from various parts of vantage in the grounds, and in particular one from a seat called "The Surprise," from which the valley of the Skell, with the Abbey, was seen to the greatest advantage. The Abbey ruins were finally reached, and impressed every one by their magnificence and extent. The cloister, the refectory, the quadrangular court, the nave and transept in the tower were closely examined, and after the whole party had been photographed they returned to the lodge, where the same conveyances were found in readiness to take them back to Ripon. During the walk to the lodge the magnificent Norway pines and American spruces were much admired. At 5.30 high tea was served at the Unicorn at Ripon, to which ample justice was done. After tea Professor ATTFIELD proposed a vote of thanks to the Local Committee for the admirable manner in which they had

carried out the arrangements, and had thus secured the utmost enjoyment for their visitors. This was seconded by Mr. SCHACHT, and carried by acclamation. Messrs. DAVISON, DRESSER, CLARK, and SOWEAY responded in appropriate terms, and Mr. REYNOLDS was also called upon to reply in the double capacity of President of the last Conference and as an energetic local helper. The proceedings were enlivened by songs by Messrs. STANFORD, PLOWMAN, HILLS, HUGHES, and ALLEN, and on breaking up the party were conveyed to the station, where a special train was waiting to take them to York. This was safely reached a little before nine, and the party dispersed, every member delighted with the excursion and carrying away the most pleasant reminiscences of Ripon and Fountains Abbey.

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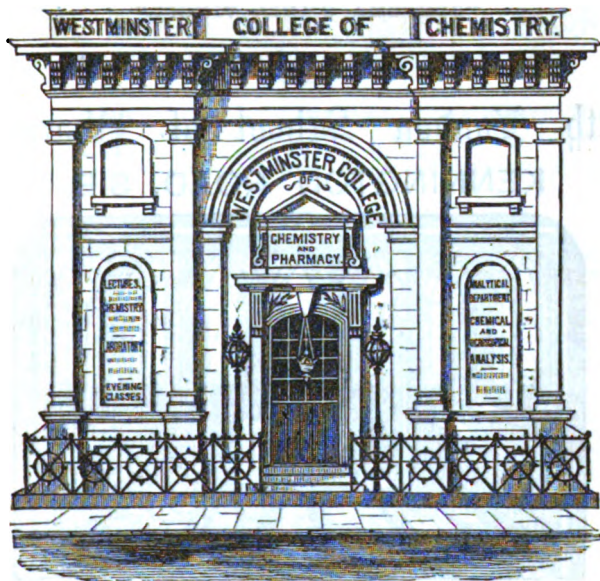
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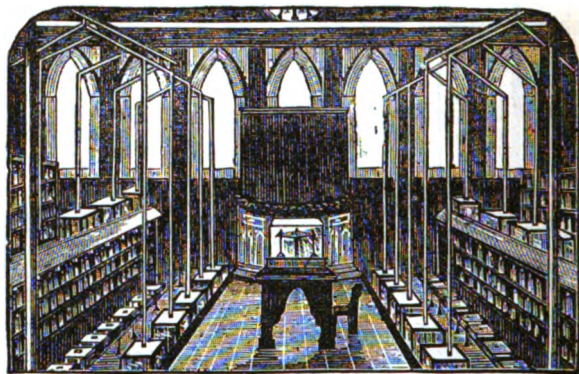
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Teacher of Pharmacy, Botany, Materia Medica, etc.—Mr. J. WOODLAND, F.C.S., F.L.S., M.P.S., Fellow of the Royal Botanic Society.

SESSION, 1881-82.

(This Session extends from September 1st to July.)

The object of this School is to impart to Pharmaceutical Students a thorough knowledge of the subjects which are required in a Pharmaceutical Education of the highest standard, and which at the same time shall fit them for passing the Minor and Major Examinations of the Pharmaceutical Society. In order that this may be acquired by all Students who enter this School, the Directors will devote their whole energies and abilities to the forwarding of this end, and Students may thoroughly rely upon whatever is stated in advertisement or prospectus being conscientiously carried out. The Directors having long had successful experience in teaching Pharmaceutical Students, and having met with much encouragement from their pupils, they feel assured that, should this reach any former Students who were under their tuition, they will readily bear out what has just been stated.

The Students will have the advantage of the direct supervision of the Principals in all the classes and laboratory work, no assistants being employed. The School Premises, situated in the Marylebone Road, are close to the Edgware Road and Baker Street Stations on the Metropolitan Railway. Omnibuses pass the School frequently, so that Students can readily obtain access from all parts of London. A Register of Lodgings is kept at the School for the convenience of Students wishing to obtain apartments.

The Proprietors wish to draw attention to the very large percentage of Students of this school who have been successful in their examinations during the past session. The following list being a summary of the success attending Students of this School during the past year of 1880:—

| | | | | | |
|---------------------|----------|-----------------------------|---------|-----------|-----------------------------|
| In February | 6 Majors | { 4 passed 2 failed | | 10 Minors | { 6 passed 4 failed |
| April | 9 Majors | { 6 passed 3 failed | | 14 Minors | { 10 passed 4 failed |
| June | 3 Majors | { All passed None failed | | 8 Minors | { All passed None failed |
| July | 8 Majors | { 5 passed 3 failed | | 15 Minors | { 10 passed 5 failed |
| October | 5 Majors | { 3 passed 2 failed | | 12 Minors | { 10 passed 2 failed |
| December | 4 Majors | { All passed None failed | | 16 Minors | { 12 passed 4 failed |

These results have been regularly published in the advertisements of the Central School of Chemistry and Pharmacy in the *Pharmaceutical Journal*. Consequently, out of 35 Major Students who presented themselves from this School, 25 passed; and of these 25, 19 passed the *1st* time of presentation. Of 75 Minor Students from this School, 56 were successful; and of these successful candidates, 46 passed the *1st* time of their presentation. These encouraging results have been obtained by the thorough and systematic co-working of Teachers and Students, and by the information in connection with the various subjects being imparted in as practical a manner as possible, so as to meet the extended requirements of the examining body of the Pharmaceutical Society. That the efforts of the Proprietors have been appreciated by Students of this School has been abundantly shown by the increase in number during the past Session.

In conclusion, if Students work steadily and well, regularly attending the lectures and classes, and diligently taking notes, the Directors can honestly assure them that they cannot fail to pass the examinations before them with credit.

CLASSES ON PRACTICAL BOTANY are held every week, at which Flowers, Fruits, etc., are provided for Dissection. All Students of this School have admission to Botanic Gardens.

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FORTIETH SESSION, 1881-82, EXTENDING FROM OCTOBER 1 TO JULY 31.

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W. J. B. & Co. caution the Trade against the so-called soluble essences now so frequently offered for sale, which are nothing more than mere tinctures, and although offered at lower prices, cost five or six times as much in use, whilst imparting a strong medicated flavour.

W. J. B. & Co. further beg to inform their friends that aerated drinks, as Pale Ale, Horse-hound Beer, etc., made from their soluble essences, are exempt from Excise regulations.

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GUM EXTRACT (French Cream).

PROTECTED BY ROYAL LETTERS PATENT.

*For producing a Permanent Head of Creamy Richness on
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Messrs. W. J. BUSH & Co., of Artillery Lane, Bishopsgate, London, Manufacturing Chemists, hereby give notice that they are sole proprietors of the patent for making the above Gum Extract, and of the recipe from which and the process by which the said extract is prepared. Messrs. W. J. BUSH & Co. hereby caution all persons AGAINST MAKING the said Gum Extract or any imitation thereof. And they also caution all persons from SELLING or USING the said Gum Extract or any imitation thereof other than that made or supplied by them or their authorised agents. The only genuine Gum Extract is that prepared by Messrs. W. J. BUSH & Co., 20 to 23, Artillery Lane, Bishopsgate, London, and the Works, Ash Grove, Hackney; and sold in bottles, price 2s. 6d. per lb., bearing their labels, and issued from their warehouses.

All persons infringing the above patent will be proceeded against, and those who give information of such infringement will be liberally rewarded.

W. J. BUSH & CO. regret having to caution the trade against spurious imitations of this article, most of which being incredible trash.

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Of the Finest Brands.

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DELECTABLE JUJUBES, VOICE JUJUBES, AND GLYCERINE PASTILLES,

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MEDICATED and HIGH-CLASS LOZENGES of every kind,
Sent out in 2-lb. or 4-lb. Bottles, Bottles Free; or in Tins, from 10 lbs. upwards.

LIME JUICE TABLETS, THIRST QUENCHERS.

ACID DROPS, AND BEST QUALITY BOILED SUGARS OF EVERY KIND.

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PENNY SUGAR WORM CAKES, suitable for either children or adults. Have an immense sale, keep in any climate, and please everybody. Manufactured by

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Discovered to be a general Anæsthetic by Dr. RICHARDSON, in 1867,
1 lb. Bottles, 16s.; 8 oz., 8s. 6d.; 4 oz., 4s. 6d.; 2 oz., 2s. 6d.

COMPOUND ANÆSTHETIC ETHER.

For producing Local Anæsthesia.
In 4 oz., 10 oz., and 20 oz. Stoppered Bottles, 2s., 4s., and 7s.

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In 4 oz. and 16 oz. Stoppered Bottles, 3s. 6d. and 12s.

PEROXIDE OF HYDROGEN.

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For promoting the Healing of Wounds by the first intention.
In 2 oz. and 4 oz. Bottles, with Brush, 2s. 6d. and 4s. 6d.; 16 oz., 12s.

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Containing pure Vegetable Ivory Charcoal.
In boxes, 2s. 6d. each.

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HUBBUCK'S PURE OXIDE OF ZINC.

PHARMACEUTICAL CHEMISTS will use this in preference to the ZINCI OXIDUM of the Br. Ph. 1867, which is a return to the process of the Pharmacopœia of 1836, being a roasted Carbonate as a substitute for the pure Oxide.

HUBBUCK'S PURE OXIDE is made by sublimation, and is warranted to contain upwards of 99 per cent. of Pure Oxide; in fact, the impurities are not traceable.

*Extract from "Pharmaceutical Journal" of May 1, 1856,
page 486.*

TRANSACTIONS OF THE PHARMACEUTICAL SOCIETY OF LONDON,
Wednesday, April 2nd, 1856.

"On Pure Oxide of Zinc for Use in Medicine."

"Mr. REDWOOD directed the attention of the meeting to the very beautiful specimen of oxide of zinc on the table, which had been presented by the manufacturer, Mr. Hubbuck. Some of this oxide had been submitted to him for chemical examination, and finding it to be remarkably pure, and to possess in a high degree all the chemical and physical qualities required in oxide of zinc intended for use in medicine, he had suggested to Mr. Hubbuck that it might be brought under the notice of the Society.

"The specimen of oxide of zinc on the table was not only free from all impurities, but it possessed the other qualities required. It was a perfectly white, light, and smooth powder.

"Mr. HUBBUCK stated that the oxide of zinc which his firm made for use in medicine was free from impurities commonly occurring in the oxide made by combustion. The zinc was first thoroughly refined, and all the lead, arsenic, cadmium, iron, and other impurities removed. The pure oxide was then produced by combustion, abstracting only the very finest part of the product for medicinal purposes. About one-tenth or one-twelfth of the whole was thus set apart in producing that from which the sample exhibited had been taken; and this could be done, since their usual operations requiring them to make several tons of oxide every day, they could separate as much as was required in a state of absolute purity, while the remainder would be equally valuable as a pigment.

"The CHAIRMAN thought the mechanical condition of substances used in medicine was often a matter of considerable importance, and ought to be considered as well as their chemical composition. He thought the specimen before the meeting was a very perfect one in every respect, and he had no doubt it was the sort of oxide of zinc best adapted for use in medicine."

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The Manufacturers supply, Wholesale only, in quantities of not less than a Quarter of a Ton.

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The attention of the Trade is invited to the following Specialties in elegant Pharmacy, which have received the highest encomiums and are being extensively prescribed by the Medical Profession. After one trial they will always find a place in every dispensary.

QUINQUININE, MACKEYS' (Registered).—Contains the pure Alkaloids of the official Cinchona Barks, and has been largely used in Hospital and private practice with great success. Takes the place of Quinine at considerably less price. Every genuine bottle has the name Mackey, Mackey & Co. Price in 1 oz. vials, 5s.; also in 25 oz. and 50 oz. Tins.

TESTIMONIALS.—"Therapeutically Mackey's Quinquinine equals Sulphate of Quinine. It is a certain tonic, and a sheet-anchor in cases where fever remits or intermittents."—*Times*. **HORNE, L.R.C.P.,** Sandwich.

"The value of Mackey's Quinquinine is certainly equal to that of Quinine. This preparation will eventually supersede the more costly Quinine."—*Chemists' Journal*.

MISTURA CERII COMP., MACKEYS'. By Royal Letters Patent.—A new and soluble compound of Cerium combined with Chloroform, Nux Vomica, and Hydrocyanic Acid. A SPECIFIC FOR VOMITING IN PREGNANCY, Sick Stomach, in alleviating the pain and vomiting in Carcinoma and general Chronic Vomiting, and reliable remedy for the cure of Indigestion, etc. Dose, 15 to 60 minims. In Bottles, 5s. and 2s.

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Tonic Digestive. Dose, 15 to 30 minims. The only reliable preparation of Bismuth.

The *Lancet* says:—"Bismuth could hardly be given in a better form."

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SAXCERE HAMAMELIS; or, Ung. Hamamelis Album.—Prepared from Witch Hazel; a most serviceable remedy for the relief and cure of hemorrhoids, valuable for sprains, wounds, and inflamed mucous surfaces. Price 4s. per lb.

MACKEYS' LIQUOR SANTAL CUM COPAIBA, CUBEBA, ET BUCHU.—When the disease is chronic, "the Liquor Santal acts like a charm." 8s. per lb. Dose, 1 to 2 drachms.

MACKEYS' CHLORODYNE.—Anodyne, astringent, antispasmodic, diaphoretic, sedative, in perfect combination, is miscible with water in all proportions, does not separate, and is most convenient for dispensing. 3s. per lb. Dose, 5 to 30 minims.

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A liberal discount to the Trade on the above preparations.

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FOR SEA SICKNESS

PRICE TWO SHILLINGS

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TESTIMONIALS.

"THE OAKLANDS, BRISTOLTON, CRESSING, August 26th, 1880.
"Please send me six bottles of your "Nauseine," which I have pleasure in stating I have found a most wonderful preventive of Sea-sickness. I cross the Atlantic twice every year, and have always suffered terribly from Sea-sickness, till the last two trips, when a friend provided me with some of your Mixture, which has proved an entire preventive.

"Yours, etc., (MRS.) A. HILL.
"To M^{rs}. R. K. KERMODE, CHEMIST."

"DEAR SIR,—It is with pleasure that I can testify to the complete success of your remedy (Nauseine) for Sea-sickness in my case. I did not expect it to prove effectual. I took it with the idea that if it did no good it would do no harm; it was therefore a glad surprise to me to reach Liverpool without being ill at all. I might add that the day I crossed (Oct. 26th) was the first after two days of storm, so that the sea was much disturbed; there was also a stiff breeze blowing.

"I am, Yours truly, W. H. GORHAM.
"To M^{rs}. R. K. KERMODE."

"6, SILVER STREET, WORCHESTER, November 14th, 1880.

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| With Cod-Liver Oil | ... | ... | ... | ... | ... | 2 6 |

Mr. Loeflund, in the Manufacture of his Extract, follows the special directions of the late Baron J. von Liebig, who personally proposed to him as early as 1866 the production of this Dietetic, the superiority of which has since been recognised by First-Class Medals awarded at the Exhibitions of Paris, 1867; Moscow, 1872; Vienna, 1873; Philadelphia, 1876, etc.

Loeflund's Extract, in preference to many others, is not subject to fermentation or deterioration in any climate.

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"Among all the preparations of Malt this has most fully met the requirements claimed for this most valuable agent."—JOSEPH F. TOBIAS.

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PILULE OF MONOBROMIDE OF CAMPHOR (SCHACHT).

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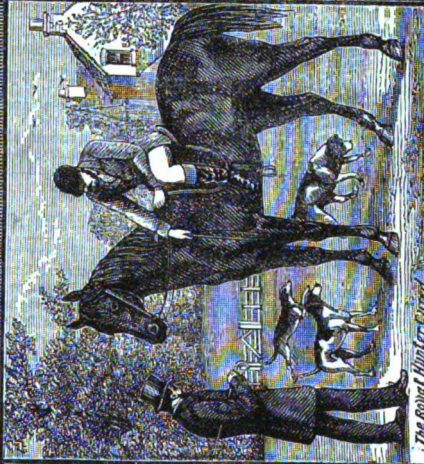
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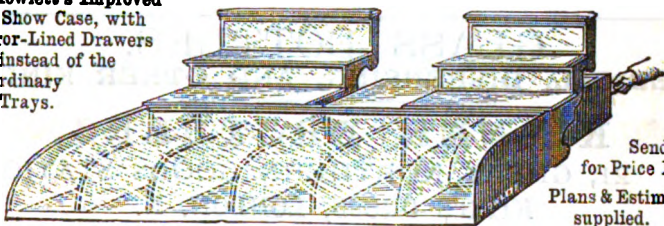
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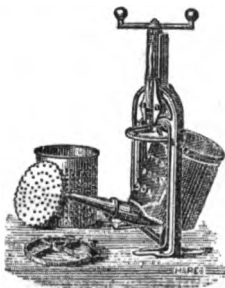
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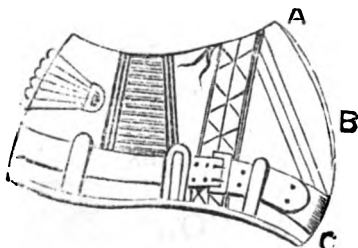
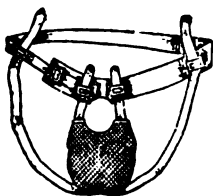
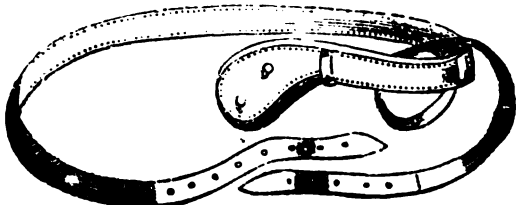
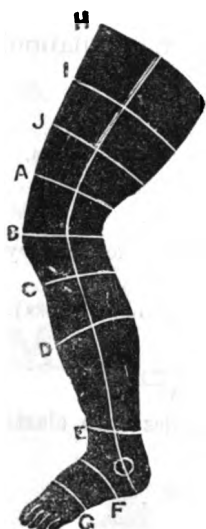
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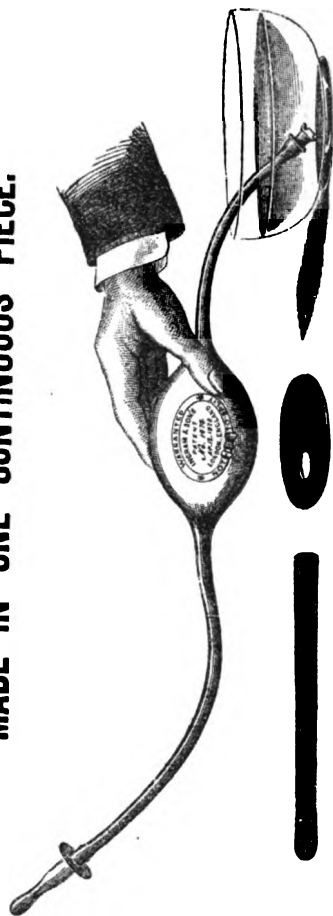
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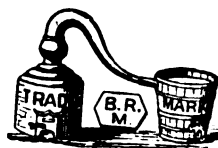
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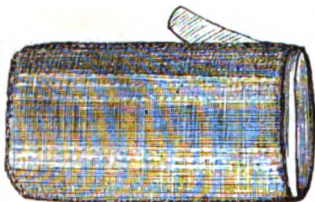
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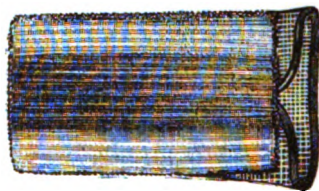
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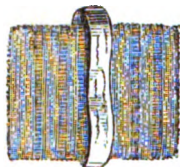
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|---------------------------------------|------------------------|---------------|-----------|-----------------|-----------|
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| | | Bottle. | ½ Bottle. | Bottle. | ½ Bottle. |
| Aesculap | Saline, Aperient | 13/6 | ... | 54/ | ... |
| Aix-la-Chapelle | Sulphurous | 15/ | ... | 60/ | ... |
| *Apollinaris (Glass) | Acidulated, Gaseous | 6/3 | 5/ | 23/ | *36/ |
| Do. (Stone) | Do. | 6/3 | 5/ | 22/ | 17/6 |
| 5 % discount on orders for 90 hamper. | | | | | |
| Beilthal | Do. | 5/ | 4/ | 19/6 | 30/ |
| Bethesda | Alkaline | 12/ | ... | ... | ... |
| Bilin | Do. Acidulous | 6/ | 5/ | 23/ | 36/ |
| Birmenstorf | Alkaline | 12/ | ... | 44/ | ... |
| Bonnes | Sulphurous | 12/ | 9/ | 48/ | 35/ |
| Bourboule, La | Arsenical | 11/ | ... | 42/ | ... |
| Carlsbad | Alkaline and Purgative | 9/6 | ... | 38/6 | ... |
| Contrexeville | Do. | 10/ | ... | 38/ | ... |
| Elms | Do. | 8/ | ... | 30/ | ... |
| Fachingen | Acidulated, Gaseous | 6/ | 4/ | 23/ | 16/ |
| *Friedrichshall | Saline, Aperient | 11/ | 7/6 | *26/ | *35/ |
| Giesshubler | Alkaline, Ferruginous | 11/ | 8/ | 21/ | 29/ |
| *Harrogate | Sulphurous | 7/ | ... | *20/ | ... |
| Homburg | Saline, Gaseous | 10/ | ... | 40/ | ... |
| *Hunyadi-Janos | Do. Aperient | 16/6 | 13/6 | *30/ | 50/ |
| Kissingen | Alkaline, Gaseous | 11/6 | ... | 45/ | ... |
| *Kreuznach | Iodized | 11/ | ... | *26/ | ... |
| Marlenbad | Alkaline Purgative | 10/ | ... | 40/ | ... |
| *Missisquoi | No Analysis given | 23/ | ... | *45/ | ... |
| *Orezza | Ferruginous | 19/ | ... | *28/ | ... |
| *Pullna | Saline, Purgative | 12/ | 8/6 | *36/ | *25/ |
| Reisdorf | Acidulated, Gaseous | 6/ | ... | 23/ | ... |
| Rosbach | Do. | 5/ | 4/ | 19/6 | 30/ |
| Saint Galmier | Do. | 5/6 | ... | 21/ | ... |
| Schwalbach | Ferruginous | 8/ | 6/ | 30/ | 24/ |
| Seltzer | Acidulated, Gaseous | 6/ | 4/ | 22/ | 15/6 |
| Sps. | Ferruginous | 9/ | ... | 36/ | ... |
| *Tarasp | Alkaline, Saline | 11/ | ... | *27/ | ... |
| Taunus | Acidulated, Gaseous | 6/ | 5/ | 23/ | 36/ |
| Vals | Alkaline, Gaseous, &c. | 8/6 | ... | 32/ | ... |
| Vichy (de l'Etat) | Do. | 8/6 | 7/6 | 31/ | 27/ |
| Victoria Ofner | Saline, Aperient | 13/6 | ... | *27/ | ... |
| Wildungen | Alkaline | 11/ | ... | 43/ | ... |
| Wilhelm's Quelle | Acidulated, Gaseous | 6/ | 5/ | 22/ | 34/ |
| *Woodhall | Iodized | 8/6 | 5/ | 23/ | *26/ |

* Original Packages of Apollinaris, Glass ½ bottle, contain 100. Friedrichshall, 30 bottle. or 60 ½ bottle; Harrogate, 36 bottle; Hunyadi-Janos, 25 bottle. or 50 ½ bottle; Kreuznach, 30 bottle; Missisquoi, 24 bottle; Orezza, 30 bottle; Pullna, 40 bottle. or 40 ½ bottle; Tarasp, 30; Victoria Ofner, 25 bottle; Woodhall, 36 bottle. or 72 ½ bottle. With these exceptions all original Packages contain each 50 bottle. or ½ bottle.

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